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Return to me no more.

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And eke with thoughtful mind;
But when returned no pencil marks
Nor dog's ears let me find.

7/6

F. R. Sturgis, M. D.
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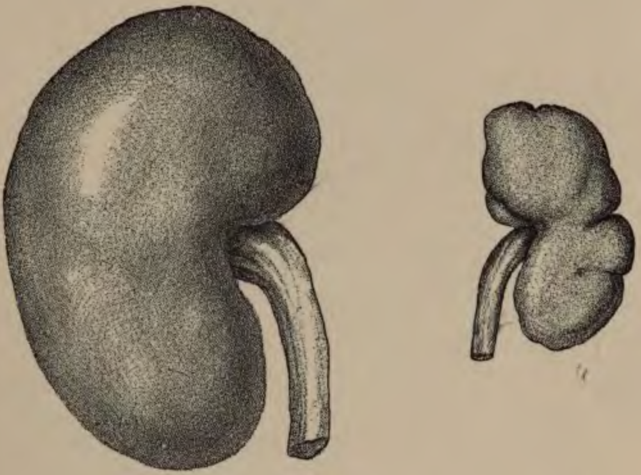

Unequal Development of the Two Kidneys.

(*Size ½*).

T. M Godart, del.

Frontispiece

REGIMENT

KIDNEY

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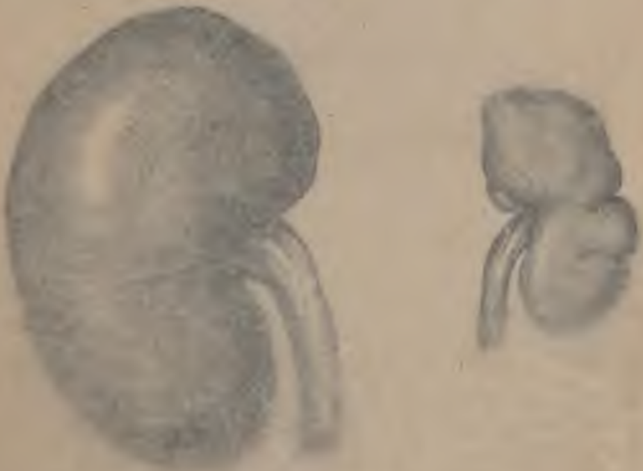

THE
DIAGNOSIS AND TREATMENT
OF
DISEASES OF THE KIDNEY
AMENABLE TO
DIRECT SURGICAL INTERFERENCE.

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BY

W. BRUCE CLARKE, M.A., M.B. Oxon., F.R.C.S.,

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PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS,

AS A SMALL TOKEN OF RESPECT

AND

AS A GRATEFUL ACKNOWLEDGMENT OF MANY ACTS OF KINDNESS

THIS WORK IS DEDICATED

BY

THE AUTHOR.

PREFACE.

THE following pages contain an account of those lesions of the kidneys which are amenable to direct surgical interference. No excuse is needed for such a limitation being placed upon this work. The more purely medical aspect of diseases of the kidney has been so often and so fully treated by other authors, that no further reason need be assigned for its omission here.

The normal anatomy of the kidney is at first briefly sketched, afterwards those deformities which are of surgical importance, and finally the pathology and surgical treatment of the various lesions is considered. The difficulty of determining for certain the presence of two kidneys is so great, that I have endeavoured to sketch in a separate chapter all that is known of the subject at present. If I have erred in the abundance of references with which the following pages are loaded, it has been from a desire to afford ready verification for my statements, and to lessen the labours of those who are pursuing a similar line of inquiry.

Much of my information is derived from a perusal of the various published cases, and more especially from the clinical records of St. Bartholomew's Hospital; and my best thanks are due to my colleagues for many unpublished cases which have been so freely placed at my disposal.

The following pages are in substance the essay to which the Jacksonian prize was awarded by the Royal College of Surgeons, in 1886. The essay was written before the end of 1885, and was, with the exception of a few pages, completed when Mr. Henry Morris's valuable work on the surgical diseases of the kidney appeared, which will explain my scant allusion to his book. The essay has been thoroughly revised, and some matter has been added in order to bring the work up to date.

The illustrations have been drawn for me by Mr. T. M. Godart, to whom I am much indebted for the trouble which he has bestowed on them. They are almost, without exception, new; one has been drawn from a photograph which was kindly taken for me by my friend and colleague, Mr. James Berry. The engraving has been undertaken by the Typo-etching Company.

My best thanks are due to the Council of the Royal College of Surgeons for permission to publish the essay.

W. BRUCE CLARKE.

46, Harley Street, W.

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during the course of an operation should at once draw his attention to the possibility of the opposite kidney being either absent or greatly diminished in size and functional activity.

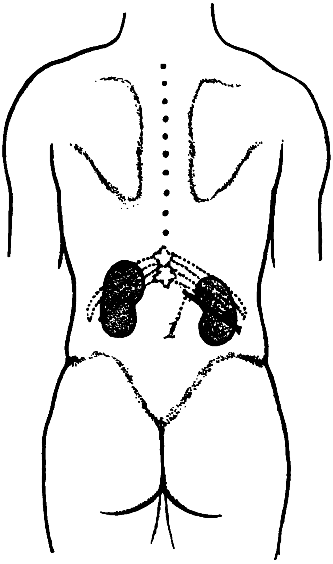
SIZE.—A normal kidney is about four inches in length, two and a half in breadth, and from one to one and a half inches in thickness. The left kidney is said to be usually longer than the right. The male kidney weighs about four and a half ounces, the female slightly less. I have, however, come across bodies in which the kidneys weighed over five and a half ounces each, and were perfectly healthy.

The kidney is surrounded by a layer of fat, by means of which it is retained pretty firmly in position, though sometimes, especially in those women who are subject to laborious occupations during pregnancy, it is liable to shift from its position and become movable, assuming that condition which is known by the name of *"floating kidney."*

Somewhere about one half of the kidney is situated below the ribs, and in cutting down upon the kidney from the back by an incision parallel with the lower border of the last rib there will be found in order after the skin and fascia have been removed first the latissimus dorsi; next to this, perhaps, a few fibres of the serratus posticus inferior; and beneath this again, towards the spinal column, is the massive erector spinæ, whilst outside it lie the external and internal oblique and the transversalis.

When these are cut through the transversalis fascia will be encountered, and, lastly, the enveloping fat of

Pl. I.



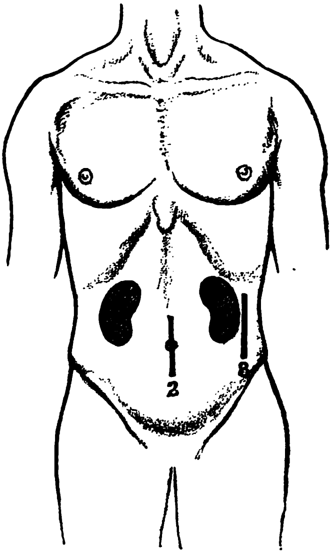
SITUATION OF KIDNEYS FROM BEHIND.
(*Diagrammatic*).

1. Posterior incision.

T M. GODART. DEL.

TO FACE PAGE 2.

Pl. II.



Situation of the Kidneys from in front.
(*Diagrammatic*).

2. Anterior incision. 3. Lateral incision.

T. M. Godart, del.

To face page 3.

the kidney. With the exception of a few branches of the lumbar arteries and nerves, there are no other structures in this situation of any considerable importance.

As the lower surface of the rib is approached, the few fibres of origin of the diaphragm may come into view, and if these are divided, the pleura, which descends oftentimes quite to the lower border of the rib, will be endangered.

On their front surfaces the kidneys are covered by peritoneum. In contact with them lie the ascending and descending colon respectively. On the front of the right kidney, towards its inner edge, is the second portion of the duodenum, and at its upper extremity the liver.

On their inner aspects, where they abut on the vertebral column, is situated the hilus, at which point the vessels enter and the ureter leaves the kidney. The vein lies most in front, next to it the artery, and hindermost of the three, the ureter, which is here expanded to form the pelvis of the kidney.

THE URETER is about fourteen inches or a little more in length, and varies in diameter from about 4 to 5 millimètres (rather more than $\frac{3}{16}$ of an inch). That is to say it admits with fair ease a No. 14 French bougie à boule, except at the vesical orifice, through which a No. 11 or 12 passes. As the result of examining fifty healthy adult ureters I found that their size varied from No. 12 to No. 20 French, but in very few cases was the larger size reached.

Bougies à boule were employed for the purpose of measurement, and they were subsequently tested in a catheter gauge.

There was in some few cases a slight narrowing about four inches below the pelvis of the kidney, and the lower half was a trifle smaller than the upper. But the vesical orifice is invariably the narrowest situation.

These variations in size will be made clearer by a reference to Plate III.

ABNORMALITIES OF THE KIDNEYS may be best considered under the following heads :—

(1). Movable kidneys, with or without a mesentery.

(2). Displaced kidneys, which are fixed in an abnormal position.

(3). Misshapen kidneys, which are often displaced as well.

(4). Single kidneys.

(5). Absence of kidneys.

MOVABLE KIDNEYS may be divided into those which are acquired and the congenital.

The acquired forms comprise those in which the kidney is movable behind the peritoneum, and the congenital those in which there is a true mesentery for the kidney. An excellent instance of the latter and rarer condition is recorded by Henderson.* Intermediate between these two conditions there are other kinds, in which greater or less mobility is present.

In some of those cases which move freely in their bed, it has been asserted by some authors that the mobility is of congenital origin; but there is, so far as I can learn, no justification for such an assertion, and

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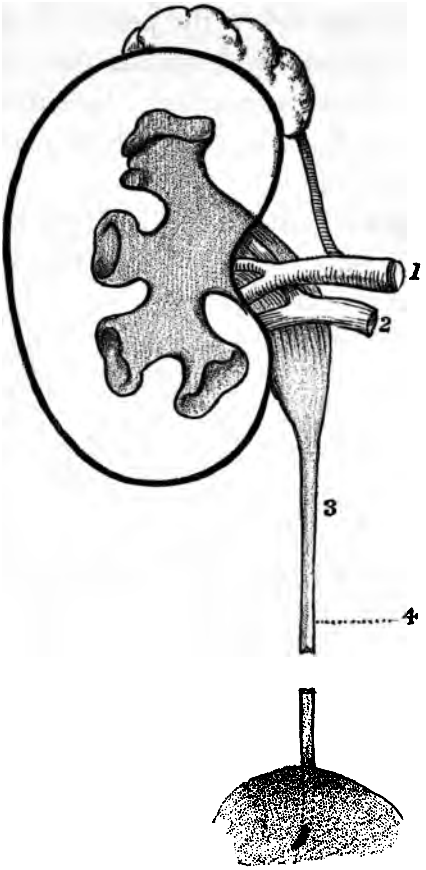
* "Med. Times and Gaz.," Vol. ii, p. 501.

Pl. III.



Diagrammatic view of the Kidney to shew its Pelvis and Ureter.

1. Artery. 2. Vein. 3. Ureter. 4. Situation of constriction.

T. M. Godart. del.

To face page 4.

the fact that the described cases refer almost without exception to the adult may be urged as a strong argument in favour of their acquired in opposition to their congenital origin.

Durham * has given an excellent account of that form of movable kidney in which there is no mesentery. He says: "On opening the abdomen the left kidney was observed to be nearer the front of the cavity than usual, and the descending colon was situated almost in the middle line. The kidney could with ease be moved some distance from its proper situation, either up on to the ribs, down into the iliac forsa, or across the bodies of the vertebræ." There is no good reason for assuming that the situation of the colon had been the cause of the extreme mobility of the kidney, for abnormal positions of the colon are common,† whilst movable kidneys are extremely rare.

My friend and colleague, Mr. James Berry, has kindly furnished me with the notes of a post-mortem in which he came across two remarkably movable kidneys. He says: "There was no mesonephron. The retroperitoneal fat was abundant, but each kidney could be readily displaced so far towards the middle line that its centre lay in the middle line of the body, directly in front of the spine. The situation of the colon was perfectly normal."

DIAGNOSIS AND SYMPTOMS.—As it is quite impossible to distinguish during life between the two conditions of movable kidney above referred to, the diagnosis of both varieties will be considered together.

---

* "Guy's Hosp. Rep.," Series iii, Vol vi, p. 413.

† See a paper "On Abnormalities of the Colon as a Cause of Unsuccessful Colotomy," by C. B. Lockwood, "St. Bart.'s Hosp. Rep.," Vol. xix, p. 255.

Such a condition is far more common in the female than in the male, and in some parts of the Continent (Skorczewsky), where the women labour in the fields to a considerable extent, it is stated that as many as 1 in 10 have movable kidneys.

THE SYMPTOMS which the patient complains of are mostly subjective. There is a dragging sensation in the loin, which varies a great deal in severity. It is sometimes especially severe in women at the menstrual period. It is aggravated by movement and by constipation, or perhaps by pregnancy. Sometimes it gives rise to vomiting. The subjective character of the pain is often well shown by the fact that it varies greatly with the health of the individual. It is often remarkable how large an amount of movement may be present without causing much pain, whilst when once the patient's attention is called to the movable kidney the pain becomes unbearable. This was very markedly the case in a patient who was under my friend and colleague Mr. Morrant Baker's care in November, 1885, and in whom both kidneys were freely movable beyond the middle line of the body. But the pain is by no means merely subjective in all. It may be real and severe enough to demand an operation for its relief. The urine is usually healthy in character, but instances are related in which the mobility of the organ has given rise to pathological conditions.* In

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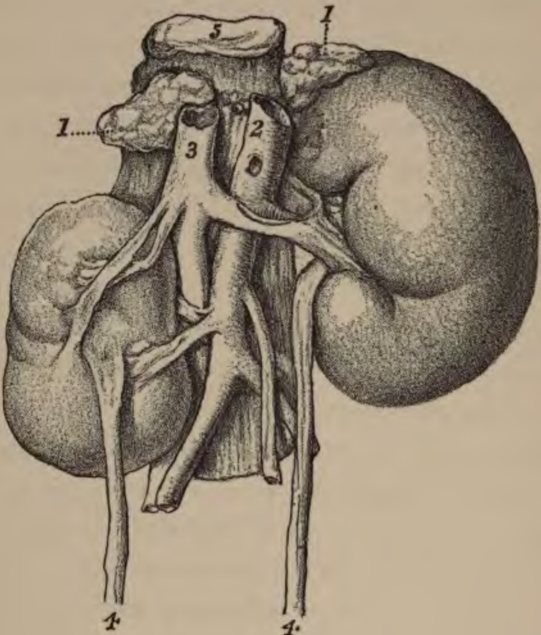
* See case described by Dr. Andrew, "St. Bart.'s Hosp. Rep.," Vol. ix, p. 211, which is elsewhere referred to in connection with the treatment of suppuration of the kidney.

Pl. IV.



MISPLACED KIDNEY.

(*Size* ½).

1. Supra-renal capsule. 2. Aorta. 3. Vena Cava. 4. Ureter.
5. Vertebral column.

T. M. GODART, DEL.

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all these cases a digital examination of the abdomen reveals a movable tumour, which can usually be pressed back into the loin, and if the patient is thin may be distinctly felt to be shaped like a kidney. By placing one hand under the loins behind, and pressing on the abdomen in front, the nature, shape, and size of the tumour is best determined. In some cases it can be percussed out, but palpation is usually a far better test of its nature than percussion.

It sometimes happens that a case in which the diagnosis of floating kidney was made during life does receive confirmation at the post-mortem.

Such cases have been mistaken for a distended gall bladder. Lawson Tait * has described a case in which such a mistake was made, and in which he afterwards performed cholecystotomy.

They have also been confounded with ovarian tumours with an elongated pedicle, with cysts of the pancreas, and even with splenic tumours. A case in which a tumour that afterwards proved to be an hydatid was diagnosed as a floating kidney is mentioned in the chapter on hydronephrosis.

An exact diagnosis is certainly impossible in all cases, but in addition to the symptoms which have been already referred to, it will be materially aided if the size, shape, and attachments of the tumour resemble those of a displaced kidney.

The question of the operative treatment of these cases is fully considered in Chapter XI.

MISPLACED KIDNEYS.—One or both kidneys may be fixed congenitally in an abnormal position. It is, however, extremely rare to find *both* kidneys placed symmetrically in such a position. If they are misplaced at all, they lie lower down than usual, somewhere in the course of the ureter, generally upon the brim of the pelvis. (*Vide* Plates IV. and V.) Very often the ureter is in front of the vessels, instead of in its usual situation behind them, giving one the impression that the lower end of the kidney had been fixed, and the upper end, being loose, had turned a somersault, and then had become fixed in its newly-acquired situation.

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* "Brit. Med. Journ.," 1882, Vol. ii, Nov. 18.

A case is recorded by Rayer* in which a tumour that was proved to be a misplaced kidney offered on two occasions considerable obstacle to parturition, though in both the labour was eventually brought to a successful termination.

Another is recorded by Durham † in which a tumour of doubtful origin existed for some time in the situation of the left sacro-iliac synchondrosis. Some years later the patient died, no exact diagnosis having been arrived at. A post-mortem examination revealed the fact that it was a displaced kidney.

A very similar case has been related to me by my friend and colleague Mr. Butlin, in which he was consulted in reference to a tumour lying over the sacro-iliac synchondrosis, because it gave rise to symptoms of pain along the spine and down the legs. He saw the case several times, and after ascertaining that the tumour did not increase in size, recommended that

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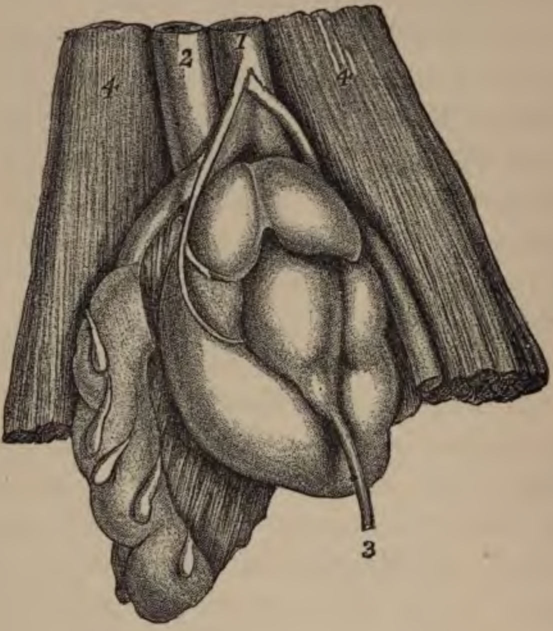
* Rayer, Vol. iii, p. 774. † "Guy's Hosp. Rep.," 1860, p. 407.

Pl. V.



MISPLACED KIDNEY.

(*Size* ½).

1. Aorta. 2. Vena Cava. 3. Ureter. 4. Psoas.

T. M. GODART, DEL.

TO FACE PAGE 9.

nothing should be done. The patient, however, was so perturbed by the thoughts of his malady and the mental agony which he suffered in consequence that he committed suicide, and a post-mortem revealed a misplaced kidney.

Polk's case, in which the kidney, in addition to being misplaced, was a solitary one, is alluded to under the head of single kidneys.

MISSHAPEN KIDNEYS.—A more puzzling condition is that in which the kidney, in addition to being displaced, is also deformed. The question will then at once arise as to whether the deformed mass which performs the function of a kidney represents one or both of these organs.

The mass may be fixed in front of the vertebral column. It may be an ordinary horseshoe kidney, such as is figured in Plates VI. and VII. and referred to on page 11. Another variety of deformed and misplaced kidney is figured in the "Pathological Transactions" by Mr. Canton,* in which the mass was situated as low down as the promontory of the sacrum. (*Vide* Plate V.)

A similar case is preserved in the museum of St. Bartholomew's Hospital. Another case in which the kidney is not situated so low down, but in which its axis is altered, is also in the museum, and is described in the Hospital Reports.†

SINGLE KIDNEY.—Scarcely to be distinguished from such cases are those which are described as instances of single kidney. Such a condition is of the utmost

* Vol. xiii, p. 147.

† Vol. xii, p. 252.

practical importance to the surgeon. The condition in which one kidney has been destroyed by disease is alluded to in a subsequent chapter. Cases of these peculiarities have from time to time been published.* For a figure *vide* Plate VIII.

There is the well-known case described by Polk,† in which the single kidney was situated on the brim of the pelvis, and was the cause of considerable distress and pain at the menstrual periods in a girl æt. 19. In consequence of this pain she underwent an operation for the removal of the kidney, and only survived the operation twelve days, the post-mortem revealing the fact that she had no other kidney. This case possesses a double interest from the fact that the single kidney, though larger than usual, was not sufficiently enlarged to afford the operator‡ any clue to the true nature of the case at the time of the operation.

THE DIAGNOSIS of these cases is in most instances impossible during life, but they serve to show how important it is to ascertain that there are two kidneys present. In any case, however, in which there is any abnormality of the organs of generation, the kidneys should be most carefully examined before any operation upon them is undertaken, as peculiarities of both these sets of organs are often associated.

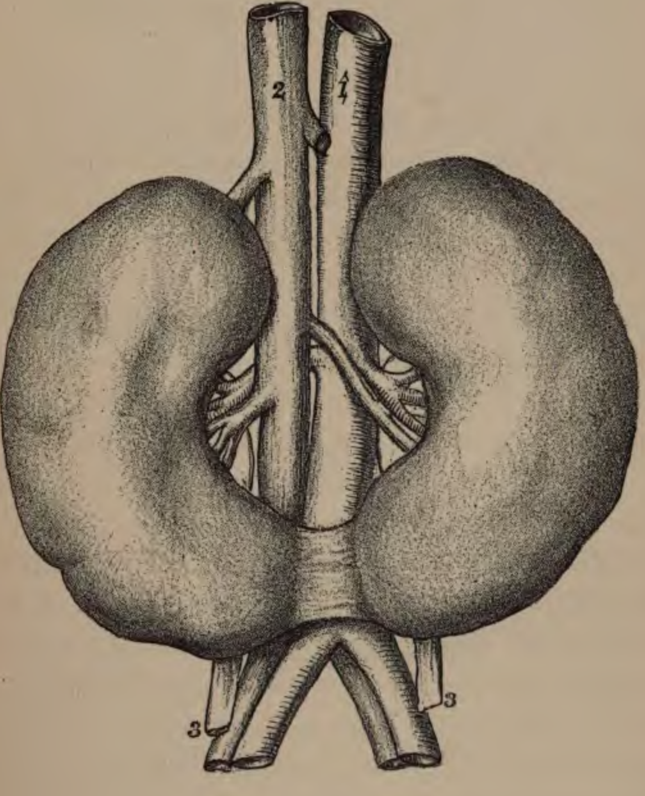
THERE IS YET ANOTHER CLASS OF CASE in

---

* "Brit. Med. Journ.," 1883, Vol. ii, p. 1014, and 1886, Vol. i, p. 252. "Lancet," 1885, Vol. i, p. 979.

† "New York Med. Journal," Feb., 1883.

‡ There are two single kidneys in the museum of St. Bartholomew's Hospital, one of which weighs 9 ounces and the other 13½. In the latter case the kidney was much congested; the man died of morbus cordis.



HORSE-SHOE KIDNEY.

(*Size ½*).

1. Aorta. 2. Vena Cava. 3. Ureter.

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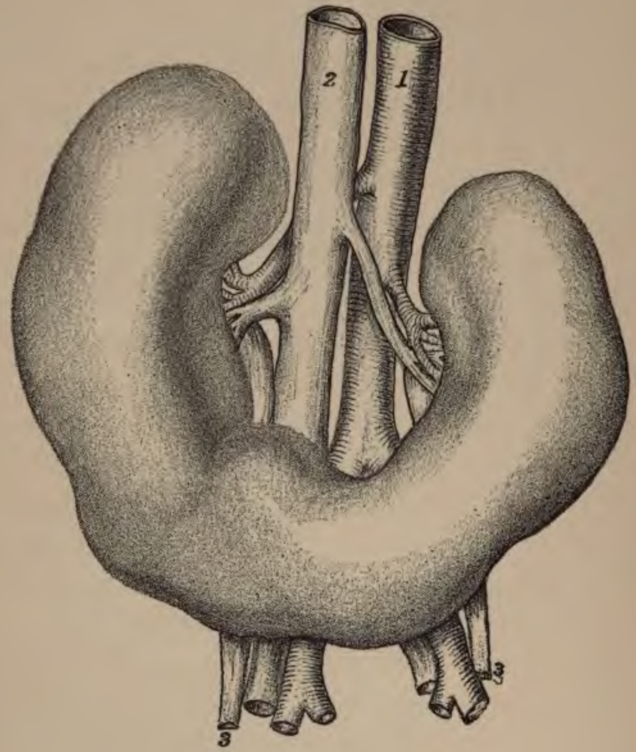


HORSE-SHOE KIDNEY.

(*Size ½*).

1. Aorta. 2. Vena Cava. 3. Ureter.

T. M. GODART, DEL.

TO FACE PAGE 11.

which, though it may be anatomically correct to say that only one kidney is present, yet there are in reality two, which are joined by a kind of isthmus; and there are in addition two ureters passing down in the usual situation to the bladder.

The most typical instance of the above-named condition is that in which the well-known variety named horseshoe kidney is present. Usually the lower ends of the two kidneys are connected together by a bar which contains but a small amount (*Vide* Plate VII.) of secreting substance, oftentimes none at all. (*Vide* Plate VI.)

The former condition is well shown in three specimens* in St. Bartholomew's Hospital Museum, whilst the latter is to be seen in a specimen from the museum of the Middlesex Hospital, in which the two kidneys, though apparently forming one organ, are so independent of each other in reality, that one has undergone suppurative changes whilst the other remains perfectly healthy.†

In other cases the two kidneys are fused so as to form a single organ, one part of which cannot suffer from disease without affecting the other. This condition is well shown by a specimen also in St. Bartholomew's Hospital Museum.‡ It is described in the catalogue as "Two kidneys of unequal size combined into an irregular form by portions which passed across the median line."

---

* Nos. 3649, 3650, 3651. A case occurred in the Dissecting Room last year.

† This specimen is figured by Morris.

‡ 3654.

The principal interest which the surgeon derives from contemplating such variations from the normal condition as those which have been enumerated in the preceding pages, is the question of where to look for a kidney which he does not find in its usual situation; whether there are one or two kidneys, and how far it is advisable to attempt any operative procedure on such an organ.

An answer to all these questions can be given with a fair degree of certainty.

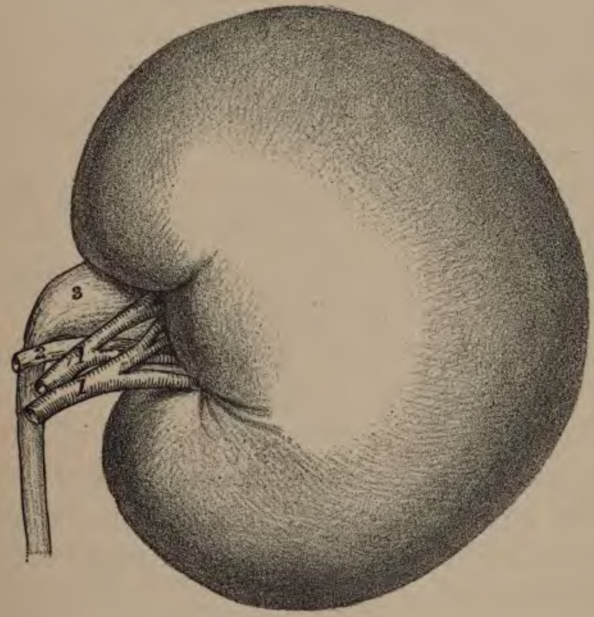
If the kidney is floating, he will probably have no difficulty in discovering its whereabouts; the renal vessels will be situated in their normal position, and will aid him in his search.

If the kidney is misplaced, it is almost certain that it will be situated lower down, somewhere in the course of the ureter, and it may be as low down as the brim of the pelvis; more rarely it lies in front of the vertebral column, or it may even be situated on the opposite side below its neighbour, or organically connected with it.

Its connections should be carefully examined with a view to determining if the two kidneys are connected together in any way; and, lastly, any increase in the size of the organ should at once direct his attention to the possibility of there being only one kidney. In such a case, opening the abdomen would certainly be justifiable, and would at once set the question of one or two kidneys at rest. The principal kidney abnormalities are figured in the accompanying plates.

ABSENCE OF BOTH KIDNEYS.—The total and

Pl. VIII.



Single Kidney.

(*Size* ½).

1. Artery. 2. Vein. 3. Ureter.

T. M. Godart del.

To face page 12.

entire absence of both kidneys, though it has been observed in an otherwise deformed fœtus, being incompatible with life,* at any rate for more than a few days, need not concern us here.

THE ONLY EVIDENCE OF ABNORMALITY IN THE ENTRANCE OF THE URETERS INTO THE BLADDER that I have been able to discover is comprised in the the following cases. Roberts † records two cases, one in which the ureters crossed on their way to the bladder, and another in which they entered normally; but both came from a single right kidney. Another case, somewhat similar to the latter, is recorded in the "Pathol. Trans.,"‡ and Morris§ mentions one or two others, in one of which there was a single ureter which entered the bladder in the middle line.

Two or three ureters may be present, but they usually join to form a single tube some distance before they enter the bladder. There is, however, a specimen in the museum of St. Bartholomew's Hospital in which two ureters from the same kidney enter the bladder separately, but quite close together. A case of double ureter for some distance is figured in Plate IX. It occurred in the dissecting-room during the past winter session. A complete double ureter is likely rather to prove an advantage than a detriment to a patient, for it is conceivable that one ureter might be blocked by a calculus, leaving the other to carry on the functions of the kidney.

---

* Moulon's case, in which a girl is stated to have lived to fourteen years of age without kidneys, must be rejected on account of the doubtful evidence on which his statement is founded.—See "Archiv. Gen. de Méd.," Tom. xvii, p. 424.

† "Urinary and Renal Disease," Ed. iv, p. 683.

‡ Duckworth, "Path. Trans.," Vol xx, p. 233.

§ "Surgical Diseases of the Kidney," p. 99.

The question of arresting the flow of urine through each ureter in turn is fully considered in a special chapter at the end of the book. Such a method, if it could be carried out with success, would undoubtedly prove invaluable, for, as we have just seen, as far as museum specimens go there is very slight evidence of the existence of ureters which enter the bladder abnormally. Too much stress, however, must not be laid on this circumstance, for it is obvious that such peculiarities, even if discovered, would attract but slight attention, and hardly be preserved if it were not for their importance from the point of view of kidney surgery.

ABNORMAL ARTERIES AND VEINS.—There is only one other set of abnormalities which need engage our attention, that is to say, those which affect the vessels.

In the arrangement of the vessels there is a considerable number of variations. Apart from such variations in blood supply as must necessarily exist in those cases in which the kidney itself is malformed, there remain those variations which have been described in the normal kidney.

A very full account of these is given by Prof. Mac Alister.* A large number of the varieties described by him do not concern the surgeon from the point of view of surgical treatment. They consist of extra branches which enter at the hilus, and which therefore would be easily found and secured at an operation.

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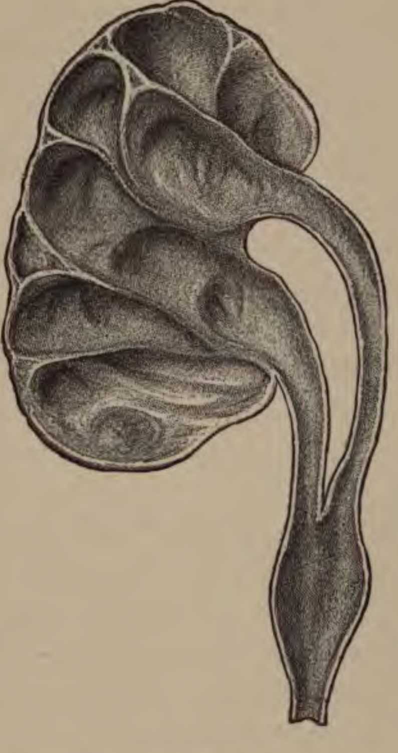
* "Journal of Anat. and Physiol.," *et ibi cit.*



HYDRONEPHROSIS AND DOUBLE URETER.

(*Size* ½).

T. M. GODART. DEL.

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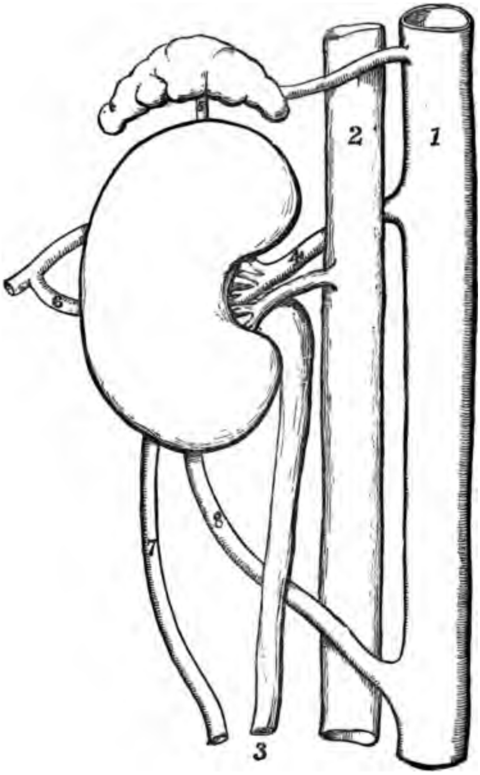
Pl. X.



ABNORMAL ARTERIAL BRANCHES.

(Diagrammatic).

1. Aorta. 2. Vena Cava. 3. Ureter. 4. Renal Artery.

Extra renal arteries { 5. Supra Renal. 7. Iliac.
{ 6. Lumbar. 8. Aortic.

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But besides these there are branches which enter at the upper and lower end of the kidney, and occasionally on its back and front surface. It is by no means uncommon to find extra branches entering at the two ends. Henle * states that such vessels are to be found in one of every seven bodies examined, but my own experience in the dissecting-room would lead me to believe that 1 in 30 would be nearer the mark. Such branches usually are derived from the aorta, the renal artery, or the supra renal, or one of the lumbar arteries. (*Vide* Plate X.) In one instance I have found a branch from the common iliac entering the lower border of the left kidney. A similar condition of blood supply is to be seen in a specimen of a displaced kidney in the St. Bartholomew's Hospital Museum, in which three small arteries from the right common iliac enter the lower end of a kidney which is situated between the two iliacs.

There is, so far as I have been able to ascertain, no special account of the abnormal veins of the kidney. In four cases of abnormal arteries which I have dissected, the veins accompanied the arteries, and emptied themselves into the veins corresponding with those arteries from which the extra arterial branches were derived.

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* "Handbuch der Gefässlehre," Vol. 1876, p. 297.

CHAPTER II.

INJURIES OF THE KIDNEYS AND URETER.

THE INJURIES to which the kidney is liable may be divided into those which are caused by bruising of the abdomen—for example, by a crush or squeeze—and those which are the result of a wound inflicted by a sharp instrument, or a bullet.

INJURIES OF THE KIDNEY WITHOUT EXTERNAL WOUNDS.—It is a comparatively rare occurrence to come across a case in which the kidney has been ruptured without the infliction of an external wound where surgical interference is called for, though many cases of probable kidney injury get well without any treatment except rest in bed.

Cases of kidney injury without external wound have been described by the older surgical authors long before any question of cutting down upon the kidney was ever entertained. Probably the earliest case of this kind is related by Galen.*

Passing on to a far later period, cases are recorded by Laub,[*] and Morgagni,[†] and Ravaton,[‡] and others. In Laub's case death ensued, the injury being caused by the fall from a mast. Ravaton's patient received a shot contusion at the battle of Deistengen. He passed blood with his urine for some time, but eventually made a good recovery, and was known to be alive and well at a later date.

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* "Quidam etiam, quum cecidisset, manente spina illæsa, in primis quidem magnam sanguinis copiam cum urina emisit, posteà vero omninò suppressa est urina. Cujus rei causam esse conjecimusque concreti sanguinis grumus intus se opposuit; quo circà demissa per colem fistula paullum urinæ reddidit, extracta deinde fistula apparuit in ipsius ore grumi indicium." Galeni, "Opera Omnia." De locis affectis, lib. vi, cap. 4.

If such an injury is severe and extensive, and involves—as it so often does—the peritoneum and some of the neighbouring viscera, death will ensue within a few hours, or days at most, and a post-mortem will reveal that with even a full knowledge of what had happened surgical interference would have been inadmissible. Such a conclusion is well illustrated by the following case, which was under my care several years back at the West London Hospital :—A. B., aged 27, was brought into the Hospital, having been severely crushed against a wall by a cart. After the injury he managed to walk some distance, perhaps two hundred yards. About half an hour later, when I saw him, there were slight evidences of a bruise in his left hypochondrium, and he complained of a great deal of pain in his left loin, shooting down into his testicle. Shortly after this he passed some urine which was of the colour of almost pure blood. About an hour and a half after his admission he became suddenly collapsed, and died in a few hours.

A post-mortem revealed the following condition of the viscera.

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[*] Laub, "Lienis et renis ruptura ex casu ab alto lethalis."

[†] Morgagni, "De sedibus et causis morborum," Epist. liv, 15.

[‡] Ravaton, "Chirurgie d'armée," 1768, p. 47.

There was a rupture of the stomach, about 2in. in length, through which its contents had passed into the peritoneum. The spleen was ruptured, exhibiting a small rent on its outer surface, and there was an extensive rupture of the left kidney, not involving any of its large vessels.

In this case, so far as the kidney was concerned, there was no evidence whatever to show that the man might not have made a good recovery, and it was almost certain that the rupture of the stomach was the immediate cause of death. Evidence of recovery from a somewhat similar injury to the kidney is recorded by Mr. Holmes.* The patient was taken to St. George's Hospital in June, 1858, suffering from the effects of a horse kick. A swelling was noticed after a few days in the region of his right kidney. The urine was at first mixed with blood, which disappeared a few days later, and about a month after admission he was discharged well. On December 14, 1859, he was readmitted, and died about a week later from the effects of a granular kidney. The ureter on the right side was completely occluded, the pelvis of the kidney was filled with clot, and the line of rupture could be distinctly traced in the substance of the kidney. There was also some old blood clot in the subperitoneal tissue in front of the kidney.

It is in those cases where the patient survives the first shock of the injury, and subsequently gives evidence of extensive injury to the kidney on one side, and where the kidney shows no tendency to undergo spontaneous cure, that surgical interference is called for.

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* "Path. Trans. Lond.," Vol. xi, p. 140.

But two cases [*] are recorded in which an undoubted rupture of the kidney substance proper has been submitted to operation: in one of these the operation was perfectly successful, but in the other, though it failed to produce a successful result, it is pregnant with suggestion for the future.

A boy aged 12 came under Dr. Rawdon's care suffering from the effects of a fall. He began to pass urine after a few hours, which was tinged with blood, and which later on contained a large amount. The blood became clotted in the bladder, giving rise to a great deal of trouble in urination, and after a few days to cystitis.

On the seventeenth day after the injury, lumbar nephrectomy was performed. The kidney was found to be almost entirely torn across, so much so that each half was ligatured separately and then removed with scissors.

After the operation, the boy went on well, and the bleeding ceased, but the cystitis did not disappear, and four days later the operation of lateral cystotomy was performed, which gave immediate and permanent relief to the bladder symptoms.

The patient became gradually weaker, and died on the forty-first day after the receipt of the injury.

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[*] "Nephrectomy for Rupture of the Kidney," by H. G. Rawdon, M.D., "Liverpool Med. Chir. Journ.," Jan., 1884. "Acute Hydronephrosis and Rupture of the Kidney treated successfully."—"Lancet," 1884, Vol. ii, p. 589. *Note.*—A third case is quoted, but I have not myself seen it. See "Annals of Surg. of St. Louis," 1885, Vol. i, 309 to 324.

At the post-mortem the opposite kidney was enlarged, and numerous small abscesses were to be seen in its substance. Its ureter was dilated and filled with pus, as also was the pelvis of the kidney. It was quite evident that the cystitis had spread up the ureter to the healthy kidney, and had given rise to his death.

It is suggested by Mr. Rawdon that in a similar case it would be best to perform cystotomy as soon as the cystitis is set up, and that failing to remove the offending kidney.

Such a plan would certainly give good promise of success, and, would at any rate, preserve the healthy kidney from a secondary pyelitis.

The second case in which operative interference was successful is recorded by Taylor.* So-called acute hydronephrosis developed as the result of an injury, and to relieve the urgent symptoms all preparations were made for nephrotomy. In the meantime the cyst burst into the peritoneum, giving rise to symptoms of profound shock. The abdomen was then opened in the middle line, the peritoneum sponged out, and the remains of the cyst stitched to the body wall. The patient recovered with a urinary fistula.

Other instances of injury are to be found in Hospital records, of somewhat similar conditions.

A most typical case of the kind is quoted by Morris in "Ashhurst's Encyclopædia," which occurred in the practice of the late Mr. Hilton.†

"A man, aged 21 years, was struck on the back by an engine. On admission he vomited, and complained

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* *Op. cit.*

† "Guy's Hosp. Rep.," Vol. xiii, p. 9.

of great pain in the abdomen just beneath the ribs, which was aggravated on the slightest pressure. The next morning vomiting and pain continued, but he was able to walk to the closet, where he passed both urine and fæces. On the day following the injury a catheter had to be passed, and a pint and a half of bloody urine was withdrawn. Some improvement followed on the fourth and fifth days, but on the eighth there was an increased quantity of blood in the urine. From the fourteenth day till his death clots of blood accumulated in his bladder, and besides obstructing the flow of urine gave rise to agonizing pain in the hypogastrium, and at the end of the penis. The pain in the penis was much relieved at times by merely passing a catheter a few inches down the urethra. A dull swelling formed on the left side of the abdomen; tympanites and delirium supervened, and the patient died on the twenty-sixth day. The kidney was found ruptured across the middle, the lower segment being cracked transversely by very numerous minute fissures. The left ureter and a branch of the left renal artery, on which a small recent aneurism was situated, opened into a large cavity surrounding the broken kidney, which cavity was filled with grumous and vilely offensive blood, clot and urine. The renal vein was not injured. In the peritoneum forming the anterior wall of this cavity there was a ragged rent, situated in a thin slough, through which offensive bloody serum was found to exude into the peritoneal sac.

Of the propriety of cystotomy in such a case there can nowadays be but little doubt; indeed, Morris tells us it was discussed in the case just cited, and had it been performed he has no doubt it would have saved much pain and suffering.

With regard to the dull swelling in the left flank, it was, as the post-mortem revealed, due to a collection of pus, blood, and urine which had formed in the neighbourhood of the kidney and in its pelvis, and could probably have been reached by an incision from the loin, as in Mr. Barker's case to be referred to later on. The proper course in such a case, more especially as the man was suffering much pain and displaying signs of great constitutional disturbance, would be to make an incision * in the loin of an exploratory nature, which would certainly have evacuated the grumous stinking material referred to, though it would have left the hæmorrhage untreated. With such hæmorrhage, which would be certain to make itself manifest at the time of operation, two courses would be open, viz., either to plug the wound deeply and trust to the formation of a clot, or perform nephrectomy, as actually was done by Dr. Rawdon. The records of kidney operations do not give much hope from plugging when an artery is wounded and not secured. More than one case has died from the non-ligature of an abnormal renal branch, and the retention of a kidney which the exploration would show to be so disorganized would be fraught with more danger than should be expected from its removal. Added to this, it would be almost certain that such an extensive injury could only

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* For situation of incision, etc., *vide* Chapter XI.

eventuate in blocking of the ureter, and so lead to secondary destruction of any part of the kidney which the injury had not already disorganized. Without the complication of hæmorrhage the exploratory operation would be sufficient at least to start with, whilst with such a complication present nephrectomy would seem to offer a better chance. Weir has, it is true, recorded a case of injury followed by suppuration, which was successfully drained,* but the cases are hardly parallel. The immediate dangers of nephrectomy, supposing it to be safely accomplished, are those either of hæmorrhage or shock, whilst the more remote depend on the possibility of the opposite kidney being insufficient for future renal wants.

In the case of disease this latter danger is not to be lightly estimated,† and even in the case of injury cannot be disregarded, as is well shown by a case published by Cock.‡

A lad, age 18, fell across a beam, and was admitted with some pain in the loins, particularly on the left side. The next day the signs of peritonitis set in, and on passing a catheter only a small amount of blood was withdrawn. After a few days the peritonitis disappeared, but some bloody urine continued to be drawn off with a catheter. As the distension of the abdomen subsided, a tumour was visible in the left renal region, and the boy died comatose on the eleventh day. The left kidney was found to be completely torn across, and into the cavity thus formed opened a branch of the renal artery. The remarkable part, however, about the case was that the left kidney and ureter were almost twice the natural size, whilst the upper part of the right kidney with the corresponding part of its ureter vein and artery was congenitally absent. An almost similar condition is figured in the frontispiece.

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* Weir, "N. York Med. Journal," Dec. 27, 1884.

† *Vide* Chapter VII.

‡ "Path. Trans. Lond.," Vol. i, 293.

The question which at once presents itself, whether there is any means of ascertaining the secreting power of each kidney separately during life, will be considered in a future chapter. (*Vide* Chapter XII).

Besides such cases as those just described, there are the rare instances in which **SUPPRESSION OF URINE IN BOTH KIDNEYS HAS RESULTED FROM A BLOW ON ONE.***

It is hardly necessary to state that the diagnosis of such a condition is surrounded with the greatest difficulties; indeed, the fact that such a condition ever obtains is denied by many. Inasmuch, however, as it certainly does occur after operation, it can hardly be a matter of doubt that it *may* be present after certain forms of injury. Mr. Marsh has recorded a case † in which, after partial removal of one kidney, there was suppression of urine in the other, and the patient died comatose several days later; and a similar case has happened to myself. But there is, so far as I can ascertain, no *undoubted* instance in which the same result has been produced by injury. The following case, as will be seen, though it renders such a state of things probable, cannot be accepted as proof positive, for there is no evidence to show that the patient had two working kidneys at the time of the accident. If there was but one working kidney, the case is merely one of obstructive suppression in a single kidney, in which the diagnosis could not be verified owing to the recovery of the patient.

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* The question of a surgical interference could hardly be considered in such a case were it not for the possibility that the obstruction might be due to a blood clot in the kidney, which was preventing the outflow of urine. Supposing such to be the case, the possibility of its removal (if diagnosed) by a surgical operation would at any rate be a justifiable proposal.

† "Clin. Soc. Trans.," Vol. xv, p. 140.

*F. S., aged 53, butcher, was admitted into Colston Ward on March 13, 1881. Slipped whilst walking in the meat market on the previous day with his elbow doubled in to his right side. It did not cause him much pain at the time, and he got up and walked home, a distance of about a mile. On reaching home he felt a severe pain in his side, and vomited several times.

March 13.—Came to the Hospital complaining of great pain in his right side and inability to pass his water; all he had passed since his fall being a little bloody urine early on Sunday morning, the day of his admission. His bladder appeared to be distended. Was put into a bath, after which he passed about a pint and a half of bloody urine. He admitted that he had been treated for stricture about four years before. Nothing but a catgut could be passed into his bladder.

From Sunday till Monday night he passed no urine

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* This case occurred in Mr. Willett's wards, and is published in the "St. Bartholomew's Hospital Reports" in 1882, but for the notes I am indebted to Mr. Bowlby, who was at the time the dresser of the patient.

at all, and there was no evidence of his bladder being distended.

On Monday night, under an anæsthetic, a No. 5 catheter was passed, and about 10 ounces of the same blood-stained urine were drawn off. On the Tuesday, March 15, about two ounces of the same coloured urine were drawn off.

16th.—Passed 12 ounces. Considerable pain in the right loin.

17th.—32 ounces. Two or three small pieces of clot came away.

After this he gradually got better, and was discharged on March 29.

The only question of operative surgical treatment that arises out of such a case is what should be done if the suppression had not been arrested when it was. There can be no doubt that, if the patient's life had been endangered, the proper course to have adopted would have been to make an exploratory incision in the right loin, where the injury was known to have occurred, so as to permit a free drainage of urine from the kidney.* If the left kidney had then shown signs of hydronephrosis, it could have been similarly treated later on. It can, however, hardly be supposed that the obstruction in the left kidney, if one existed, was of a mechanical nature, so that it is scarcely within the bounds of possibility that any operation on this side would have been necessary as well.

The immediate dangers of kidney injury have been considered; it remains only to discuss those which are more remote, viz., formation of a blood-cyst which invades the surrounding tissues, *Perinephritis* (sometimes badly described as traumatic hydronephrosis), *Pyonephrosis,* and *Hydronephrosis.* The two latter affections, though they do occur separately, are oftentimes merely different stages of the same; and it is questionable whether Marshall's * case of the successful diagnosis and satisfactory treatment of a blood cyst in connection with the kidney should not be so reckoned too.

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* For a case in which this treatment was successfully applied to a case of Obstructive Suppression from Stone, *vide* Chapter VI.

The following outline will serve to convey the main features of the case:—

A girl, æt. 13, was run over across the loins in March, 1882. She was kept in bed at home for some time, and by the following August was so far recovered that she was able to go to school, though she had suffered considerable pain in the meantime. There was no history of hæmaturia or any urinary trouble at any time during the progress of the case.

A few months later the pain returned, and she was admitted into University College Hospital in Dec. 1882, *i.e.,* nine months after the accident, and on Dec. 22 the following note was taken:—There is a fluctuating tumour extending over the left side of the abdomen in front from the iliac fossa to the ribs, about one-and-a-half inches beyond the middle line. It is dull all over, except where a band of resonance stretches across it above (presumably the transverse colon). Urine scanty; high-coloured. Pulse 128 T. 103 F.

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* "Med.-Chir. Trans.," Vol. lxvi, p. 311.

The tumour was aspirated just to the left of the umbilicus, at its most prominent part, and five ounces of yellowish fluid were withdrawn, which were found to contain ·55 p.c. of urea. The patient was much relieved by the operation, but about ten days later, as the symptoms again returned, she was placed under the influence of an anæsthetic and the tumour was incised and drained antiseptically. Thirty-six ounces of a chocolate-brown-coloured fluid was withdrawn.

A few days later a little pus escaped, but she made an excellent recovery, and left the Hospital well on April 16, 1883.

After the operation the patient passed from 30 to 40 ounces of urine containing from 2·4 to 3·6 p.c. of urea.

Such is the clinical history as related by Marshall, and by him it is termed a suppurating traumatic hæmatoma connected with the left kidney. Its correct nature cannot, of course, be determined for certain except by the results of an autopsy, but it is, I confess, a matter of some doubt whether the clinical characters do not rather warrant one in suggesting that it was the result of an injury to the ureter or pelvis of the kidney rather than to the kidney proper. Its analogy with Barker's case[*] is in some respects very striking. If this be so, it should be classed rather as a hydronephrosis or pyonephrosis leading to perinephritis, like the cases to be next considered.

SIMPLE PYONEPHROSIS as a result of injury, without any evidence of an antecedent hydronephrosis, is a rare affection, but a typical example is recorded by Pollock[*] in which death ensued two years later.

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[*] *Vide* Chapter II, *infra.*

"A gentleman was bruised over the left loin by a fall in the hunting-field, and experienced severe pain in the back on arriving home. He was judiciously treated for some weeks after the accident, and came under the notice of the author some months subsequently. The bladder was now very irritable, and highly offensive urine mixed with pus was constantly passed. There was every evidence of an abscess of the kidney. The quantity of pus was sometimes very considerable. His health became gradually deteriorated, and death occurred about two years subsequent to the accident. The left kidney was entirely destroyed; and in its situation was found a large irregular abscess, with its walls adherent to the surrounding soft tissues, and its cavity continuous with the ureter"—that is to say, it was partly nephritic, partly perinephritic in character. In the light of our present knowledge such a case would certainly be drained from the loin, and a favourable result would probably accrue. If drainage were insufficient, the kidney could be removed later on. Cases of simple hydronephrosis following injury are recorded by Hicks,[†] Croft,[‡] and Solier.[§]

Croft's case recovered after repeated tapping, but the results of the treatment pursued in the other cases I have not been able to ascertain. More recently another case has been recorded.* A child, age 10 years, fell downstairs, and severely bruised her right side. A few hours later she passed some blood-stained urine, and in a few days there was a swelling detected in the situation of the right kidney, which extended from the liver to the crest of the ilium. It was aspirated, and 44 ounces ot clear fluid were drawn off, having a specific gravity of 1007. This was repeated some days later, when a somewhat similar amount was evacuated. A week after this the tumour had refilled, and the constitutional symptoms pointed to the necessity for further interference. Nephrotomy was performed by the lumbar incision, and after the tumour had been drained for little more than five weeks it ceased to secrete and the patient made a good recovery.

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[*] Holmes, "System," Ed. iii, p. 882.
[†] "New York Med. Record," April 17, 1880.
[‡] "Brit. Med. Journ.," 1881, p. 123.
[§] "Lyon Méd.," No. 45, 1880.

INJURIES OF THE URETER WITHOUT EXTERNAL WOUND.—Closely akin to many of the injuries above described, and during life scarcely to be distinguished from them, is that of injury of the ureter by contusion. Several cases are related,† but all of them except Poland's were injuries of the upper dilated end of the ureter or pelvis of the kidney, and some were complicated by an injury to the kidney as well. Stanley was one of the first to draw attention to such cases. One of his cases ended in recovery after frequent tapping, and cannot therefore be pronounced with certainty to have been a ruptured ureter, and the other died at the end of ten weeks under similar treatment.

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* "Hydronephrosis after injury treated by Nephrotomy." "Boston Med. and Surg. Journal," Feb. 22, 1883.

† Poland, "Guy's Hosp. Rep.," Vol. xiv, *et ibi cit.* Stanley, "Med.-Chir. Trans.," Vol. xviii and Vol. xxviii. Reginald Harrison, "Lectures on Surgical Diseases of the Urinary Organs," p. 328. Barker, "Lancet," Jan. 17, 1885. Pye-Smith, "Path. Trans.," Vol. xxiii, p. 159, has described a case in which the ureter was found obliterated two inches below the kidney. In this case no tumour occurred till two years after the kick, at which time there was hæmaturia for nine days. The tumour was tapped several times, and the patient died of exhaustion some months after leaving the hospital. It is suggested that gradual contraction of the ureter took place after the injury, and thus a stricture of the ureter was formed, much in the same way as one is usually formed in the urethra.

Barker's case remains as the only one in which an accurate diagnosis was crowned with a successful termination, and in which the operation of nephrectomy was confirmatory of the clinical details.

Case.—The child, age three years and eight months, was run over on August 13, 1884, and passed some urine containing blood clots. The child progressed favourably and went home on August 28, but became so much worse that she was readmitted on September 1, with a fluctuating swelling, having all the clinical characters of a hydronephrosis, and there was no evidence that any urine from the affected side was entering the bladder. As the constitutional symptoms gave rise to apprehension, the tumour was first aspirated, then drained, and finally removed on November 19, the patient making a good recovery.

Judging, then, from the results of treatment hitherto adopted in Stanley's, Barker's and Marshall's case, if this latter is to be regarded as a ruptured ureter, and its analogy with the other two cases is, as we have seen, most striking, the proper treatment to pursue is that which is adopted in hydronephrosis* of non-traumatic origin, viz., puncture, drainage, and these failing, nephrectomy. The only question of doubt is whether it is advisable to aspirate before draining, and this must be decided by the special characters which each case presents. Were it absolutely certain that the ureter were blocked, aspiration would be a useless precursor; but looking to the uncertainty of diagnosis that must necessarily prevail in a case of this sort, aspiration should probably be adopted first, and drainage as soon as the actual nature of the tumour is determined.*

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* For further information on the point, *vide* Chapter V.

It only remains to consider the time at which the operation should be performed. At first the possible complication of injuries of other abdominal viscera must necessarily be a matter of doubt, and so long as the ureter is pervious, as it was in Barker's case at first, there is every reason to abstain from meddlesome surgical interference. The time to interfere and the exact mode of interference must be determined by the severity of the symptoms and the requirements of each individual patient, bearing in mind the principles just laid down.

DIAGNOSIS OF INJURIES OF THE KIDNEY AND URETER WITHOUT EXTERNAL WOUND.—Of the diagnosis of such cases there is but little to add to what has been already related of their clinical history and treatment. When complicated with a contusion or rupture of any other viscera, their exact or even approximate nature will probably be only determined by a post-mortem. When confined, however, to the kidney, their character may be readily inferred (1) by the passage of blood* with the urine; and (2) by the pain in the loins, accompanied, perhaps, by the retraction of one or both testicles,† and later on by the presence of a tumour‡ in the loin with considerable rise of temperature. The tumour, if it is of considerable size, will be painful, fluctuating, and situated behind the colon. In some cases the corresponding leg is contracted and in one case was paralysed, the paralysis § ceasing when the abscess was opened. From a perinephritic abscess, the result of injury, it would probably be impossible to distinguish an abscess of the kidney itself. Such an abscess would probably, however, be secondary to renal abscess, and if it originated outside the kidney to start with, could only be distinguished from an abscess of that organ by the absence of pus in the urine, whilst the treatment of the two affections would differ in no respect.

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* All these cases are in reality mixed cases of hydronephrosis and perinephritis, in which the perinephritis was very limited owing to the gradual and slight escape of the urine into the surrounding tissues, the cyst wall being partly renal and partly perirenal in character. The slight amount of extravasation was no doubt principally dependent either on the fact that the ureter remained so long pervious, or else because the secretion of the kidney was suspended owing to interference with its blood supply. When the ureter is not pervious, if secretion go on at all in an injured kidney the urine must distend the surrounding tissues and give rise to a perinephritis of a more severe character.

Other cases of a somewhat similar description are related by Dickenson [*] and Trousseau.[†] In some of these hæmaturia was a symptom in the early stage, pointing with some probability to the fact that the perirenal mischief was but a second edition of the renal.

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* For the differential diagnosis of hæmaturia, *vide* Chapter IX.

† These two symptoms are quite classical. *Vide* Celsus, "De re medicâ." lib. v, sect. 26. "Renibus vero percussis, dolor ad inguina testiculosque descendit, difficulter urina redditur, eaque est aut cruenta aut cruor fertur."

‡ See general diagnosis of renal affections.

§ For such a case compare "Perinephritic Abscess," Fenwick, "Lancet," 1885, Vol. ii, 143.

WOUNDS OF THE KIDNEY WITH PROTRUSION.—Like every other organ of the body, the kidney is occasionally subject to wounds. In several cases the kidney has actually protruded through the wound. Two cases are quoted by Mr. Barker,[‡] one that of an Austrian peasant, in whom the kidney was forced out of the wound some two hours after the wound was inflicted, and was removed with very little pain by Prof. Brandt of Klausenberg, the patient making an excellent recovery. The other occurred in an Algerian woman. The pedicle was ligatured, and the kidney allowed to slough off.

Such cases present difficulties neither in diagnosis nor treatment. An attempt should be made in any similar case to reduce the herniated organ before suggesting its removal; and the treatment adopted by Professor Brandt might judiciously be substituted for the rough and ready surgery of Algeria.

Another case is quoted by Morris from Beck, in which a protruding kidney was successfully returned, and the patient made a good recovery.

A case in which the kidney was wounded, could be felt, seen, and was slightly protruding, is recorded by Vernon.[§] The patient passed bloody urine for some days both by the wound and urethra, but made a good recovery in about eight weeks.

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[*] "Renal and Urinary Affections," Part iii, p. 672.

[†] "L'Union Médicale," August, 1862, p. 408.

[‡] "Med. Chir. Trans.," Vol. lxiii, p. 185.

[§] "St. Bart.'s Hosp. Rep.," 1866, p. 124.

WOUNDS OF THE KIDNEY WITHOUT PROTRUSION may be divided into two classes, viz., those which are inflicted by sharp instruments and those which are the result of gunshot wounds. The former class, though rare, are mentioned in most of the older surgical writers, and an excellent *résumé* of the literature of the subject is given by Rayer.* One case which he quotes from Bourienne is so typical of such cases, that one need make no excuse for reproducing it.

A corporal of the Quercy regiment was brought into hospital on the 18th of July, 1772, having received a wound from one of his comrades' bayonets in the left loin. The pain at the site of the wound was considerable, and he felt a desire to vomit. The lower part of the abdomen was tense, and the testicle on the same side retracted. There was no swelling about the wound. A simple dressing was applied, and he was put upon a light diet and kept perfectly quiet. The following morning he complained of inability to pass his water, and in spite of violent straining none passed. During the course of the day he passed two potfulls of rose-coloured blood, confirming the diagnosis previously made that the kidney had been wounded. Now that the bladder was freed from clots urination went on as usual. During the following night he lost a considerable quantity of blood from the lumbar wound, but it was arrested by pressure. The next day the bleeding was again repeated. On the third day he again endeavoured to pass urine unsuccessfully. As the region of the bladder was very tender, attempts were made to draw off the water with a catheter, and at last he succeeded in evacuating a clot after the catheter was withdrawn. The clot was over three inches in length. The urine now came away freely, and the pain disappeared.

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* " Vol. i, p. 248 *et seq.*

On the sixth day the pains returned, the abdomen became tense and tender, and so was the bladder; he perspired very much, and his skin felt hot, and later on became dry. He was bled, and his symptoms at once were relieved. Pains returned a little later in his bladder, and he was unable to pass water. The catheter could not be passed into the bladder. After much straining, and very considerable pain, he at last passed three clots of considerable size; the passage of urine again became easy, and no further complication ensued. Fomentations were continued to the abdomen, and on the twelfth day he complained of nothing but a slight pain in the stomach. After this he made an uninterruptedly good recovery, gradually took to solid food, and was discharged completely cured on the twenty-fourth day from his admission.

Cases of slighter injuries to the kidney are mentioned by Sir Astley Cooper, by Ackerley,* and by Johnston:† and Holmes‡ has published a case of probable wound of the ureter. In most of these cases hæmaturia formed a marked feature of the patient's symptoms. Rayer was only able to discover one instance in which the wound that was inflicted on the kidney during life had actually been verified by a post-mortem, but the clinical history of Bourienne's case, and of other similar ones, can leave no possibility of doubt that such wounds may, and often do, terminate in recovery.

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* "Observations on Wounds of the Abd." "Lond. Med. Gaz." Vol. xx, p. 549.

† "Brit. Med. Journ.," 1857, p. 275.

‡ "Med. Chir. Trans.," Vol. lx.

DIAGNOSIS AND SYMPTOMS.—The presence of blood in the urine, and of urine in the lumbar wound, are the only two symptoms by which a diagnosis can be with certainty arrived at. Added to these, the pain which will radiate down into the testicle, and along the other lumbar nerves, and the retraction of the testicle, will be the only unequivocal symptoms on which reliance can be placed.

The principal dangers to be apprehended are those of hæmorrhage and collapse in the early stage, and of peritonitis, after the first few days have elapsed. As has been already pointed out when the question of subcutaneous ruptures was discussed, the difficulty in arriving at a correct diagnosis is sometimes insuperable.

So far no instances have arisen for putting into practice the principles of modern renal surgery in cases of punctured or incised wounds of the kidney, but one need have no hesitation in affirming that if violent hæmorrhage ensue, and the patient's condition is sufficiently favourable, nephrotomy should be undertaken for purposes of exploration, and nephrectomy performed if the kidney should prove to be so lacerated as to be beyond repair. Under ordinary circumstances, however, this will rarely be required ; rest, opium, and good drainage will prove the most appropriate means of combating most of the symptoms, whilst, if peritonitis ensue, the washing out and drainage of that cavity, which has been successfully accomplished in a subcutaneous wound, would be perfectly justifiable.

If clots form in the bladder, they should, as we have seen, either be broken up by a catheter or cystotomy be performed, so as to prevent their accumulation, and give them a ready means of exit.

GUNSHOT WOUNDS OF THE KIDNEY AND URETER. — The principles which have been laid down for the treatment of incised wounds apply with equal force to those which are inflicted by a bullet, with perhaps this difference, that the greater uncertainty which must necessarily prevail as to the course of the bullet would rather point to interfering as little as possible with the wound unless the onset of hæmorrhage or peritonitis render such a proceeding absolutely necessary.

CLINICAL HISTORY AND PATHOLOGY.—A most remarkable case is described both by Guthrie and Hennen, and has lately been quoted by Henry Morris.* It illustrates well the dangers, diagnosis, and treatment of kidney wounds.

"An officer was wounded by a musket-ball which entered close to the interval of the ninth and tenth ribs, about midway between the sternum and the spine, and was cut out from near to the point of the transverse process of the lowest dorsal vertebra on the day after the receipt of the wound. Within an hour of the wound he voided a quantity of bloody urine. He was in extreme pain, which was aggravated by his being moved a distance of three leagues the same night. Soon the pain spread from his wound over his bowels, and delirium set in. He was then bled several times, and blisters were applied to his abdomen. Then followed intense pain in his right shoulder, and the wound in his back nearly mortified from his lying so long, but in seven weeks he was well enough to be sent to England. The journey excited fever, peritonitis again set in, and a tumour formed in the site of the posterior wound, which was opened at the end of a fortnight, and six ounces of pus, having a urinous smell, were discharged. The discharge continued for some time, and another abscess formed lower down, which was punctured in about three weeks, and a large quantity of pus of the same kind escaped. The abcess healed, and burst again and again; pain, emaciation, and frequent micturition, with actual lessening of the quantity of urine voided, together with symptoms of renal colic followed; and then, at the expiration of seven months from the infliction of the wound, he passed, per urethram, something having the shape of a short, thick shrimp, which upon examination proved to be a piece of cloth covered with black grit. After this he rapidly convalesced."

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* "Ashhurst's Encycl.," Vol. v, p. 926.

Additional histories of kidney injury from gunshot wounds are furnished by the account of cases which occurred during the American war.* The only symptoms by which such injuries could be with certainty diagnosed were either by the passage of urine through the wound, or of blood with the urine after a bullet wound in the region of the kidney. Other confirmatory symptoms were generally found in pain and retraction of the testicle, or in pain passing down along some of the branches of the lumbar plexus. In one case there was actually paralysis of the leg muscles. In several cases both the colon and the kidney were injured, and there was a fæcal fistula. It is also significant that the bladder trouble which resulted from the wound of the kidney gave rise in many cases to more pain and discomfort than the original wound. In two cases a phosphatic stone resulted.

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* "History of the War of the Rebellion in America," Otis. Vol. ii, p. 164.

But little good was obtained from surgical interference at the onset; as a rule the bullet could not be found, and the probing of the wound only gave rise to more inflammation. Later on, when abscesses formed, their timely evacuation led to the best results. In no single instance was there extensive urinary infiltration, which fact is probably attributable to the eschar formed by the bullet in its track, which eschar formed a protection against extravasation until such time as some inflammation of the surrounding parts supervened and prevented any further chance of urinary exudation.

This fact has received further confirmation from the history of a case * that occurred during the war in Egypt, in which complete recovery took place. In this instance, as will be seen, though the peritoneum

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* Perforating gunshot wound of abdomen, implicating kidney, profuse secondary hæmaturia, recovery. Hayes, "Brit. Med. Journ.," 1886, Vol. i, p, 150.

was perforated, no peritonitis of any importance ensued.

Private H. was shot at Sabathu on July 8, 1884. The ball entered a little to the right of the umbilicus, and passing backwards and slightly downwards, found its exit at a site corresponding to the position of the right kidney. The hæmorrhage immediately following the injury was not very profuse, but collapse was intense, and pain apparently excruciating. He was treated with opium, low diet, and enema, as his bowels had not been open for several days.

July 10.—Much better, less collapsed, severe abdominal pain in paroxysms. Passed, without catheterism, smoky urine. No tenderness of abdomen or emphysema of wound.

July 11.—Slightly jaundiced. No hæmorrhage or spasmodic pain ; bowels not open, except after enema.

July 12.—Very little pain. Urine darker, more jaundice.

July 13.—Rather better. Urine as before. Enema of castor oil.

July 14.—Less jaundice. Urine lighter. Enema not acted. Ordered enema of sulphate of magnesia.

July 16.—Passed a copious solid motion. Urine clear.

July 17.—Suddenly expressed a desire to micturate, and passed a large quantity of bright arterial blood.* This recurred, and was followed by intense collapse. Ordered beef tea and brandy, with tannic acid and ergot.

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* A somewhat similar case, in which secondary hæmorrhage occurred, is related by Gorham. "Brit. Med. Journ.," 1881, Vol. ii, p. 1050.

July 18.—Much better. Ergot and tannic acid still continued.

July 19.—Urine chocolate coloured, a little pus. Bladder washed out with tepid water; drainage tube inserted behind, a little healthy pus escaped.

July 21.—A good many clots per urethram; bladder washed out with carbolic acid.

July 22.—Temperature rose to 104—probably malarial.

July 29.—He had had several febrile attacks during the week, and some pus was discovered near the posterior wound, which was evacuated with a trocar and canula, and dressed antiseptically.

Aug. 5.—The sinus at the exit aperture was discovered to extend by the aid of a probe close to the aperture of entrance.

Aug. 27.—Sinus slowly closing.

Dec. 2.—Completely recovered.

Shortly after this he returned to duty.

No case could establish more emphatically the benefits of an expectant treatment, and the fact that the passage of a bullet both through the peritoneum and kidney is by no means necessarily fatal.

In the after treatment of this, and in analogous cases which occurred during the course of the American war, no point seemed to exercise so important an influence on their recovery as the keeping of the colon emptied and free from solid fæces. In many cases it was clearly demonstrated that the accumulation of fæces gave rise to pain and recurrent attacks of bleeding. Many of the American wounded are known to have lived for some years after the infliction of the wound, and some who died afforded by their post-mortem abundant evidence of the capabilities of the kidney for repair, and subsequent functional activity. In the American cases, if death occurred during the first few days, it was almost invariably due to peritonitis, occasionally to secondary hæmorrhage, but this usually occurred later on. Treatment of both of these complications was in the American war rarely attempted, and was never attended by success; but there can be no doubt, as we have seen, that by the light of recent surgical practice it would be justifiable to open the abdomen and wash out the peritoneum, or to examine and, if need be, remove the kidney.

It must be borne in mind that nephrectomy was only performed for the first time some years after the termination of the American war.

GUNSHOT WOUNDS OF THE URETER.—The only undoubted case of this kind which has ever been verified by a post-mortem was that of the Archbishop of Paris in 1848. Such wounds would be difficult to diagnose and to distinguish from those of the kidney in many cases, and they must be treated in accordance with the same surgical principles which are followed in the case of kidney wounds.

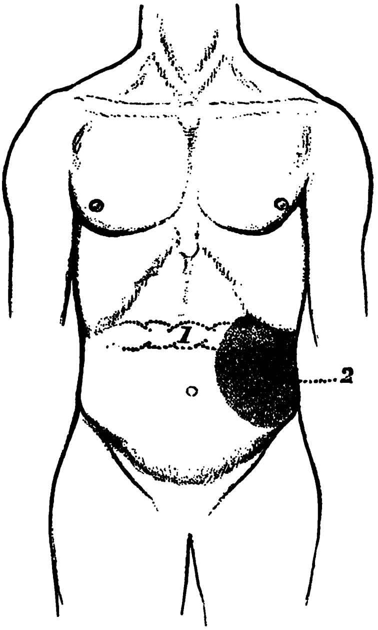
CHAPTER III.

NEW GROWTHS IN THE KIDNEY.

Since the term Tumour of the Kidney, when used in a clinical sense, signifies any form of swelling of that organ, and since the diagnosis of renal neoplasms depends mainly on their anatomical relations, it will be convenient to remember that, in their earlier stages at least, it is often impossible to distinguish a malignant tumour from other clinical tumours, such as hydatids, etc. The remarks, therefore, on the diagnosis of malignant growths, will, so far as their anatomical situation is concerned, apply equally to other enlargements which involve the kidney, and need not be repeated when the diagnosis of such affections is considered further on.

The new growths of the kidney, at least so far as they come under the hands of the surgeon, are almost limited to Sarcoma in children and Encephaloid in the adult. The rarer conditions of Schirrhus, Colloid, and Epithelioma have seldom even been guessed at during life, and the same remarks apply equally to all benign growths, such as the osseous growths mentioned by Rayer, or the fibrous and fatty growths, of which latter Mr. Heath has described an excellent example in the

Pl. XI.



SITUATION OF A KIDNEY TUMOUR.

1. Colon. 2. Area of tumour.

T M. GODART. DEL

To FACE PAGE 45.

"Path. Soc. Trans.," Vol. x, p. 199; the lymphatic tumours, which have been met with in combination with leuchæmia; and the lately described cases of Rhabdomyoma.

The only case in England in which a non-malignant neoplasm of the kidney has been diagnosed during life, so far as I can learn, is one which consisted of fibrous tissue, and was shown by Dr. Wilks at the Pathological Society. It had attracted notice as an abdominal tumour for six years previously, but as it gave rise to no serious symptoms would hardly have been handed over to the surgeon. Czerny removed a kidney containing an adenomatous growth. Thomas and Bruntzel have each removed a kidney in which a fibroma was growing from the capsule, and Peaslee has removed a solid tumour, whilst Billroth has successfully operated through the loin for a papilloma.*

DIAGNOSIS.—The two main points upon which the diagnosis of a tumour of the kidney depends are the presence of a lumbar swelling growing forward into the abdomen with the colon in front of it (*vide* Plate XI.), and the occurrence of hæmaturia. It may be safely asserted that if both of these symptoms are present but little doubt need be felt as to the diagnosis. Roberts has, however, placed on record a case in which both the tumour and the bleeding were due to an enormous spleen, and the kidneys were shown to be healthy at a post-mortem some months later. But frequently there is no hæmaturia at all, or, at any rate, only at a very late stage of the disease, and the tumour, if not too small to attract attention, is masked by the other adjacent organs, or by the excessive development of abdominal fat, until it attains to such dimensions that surgical interference is out of the question, whilst in very rare cases the disease may run a latent course throughout, and present neither of the above-named cardinal symptoms.*

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* Gross. "Amer. Journ. of Med. Sci.," July, 1885.

It should be borne in mind, too, that the colon is often displaced congenitally, and hence its non-appearance in front of the tumour in the abdomen need not be regarded as absolutely indicative of its non-renal origin. Such a case occurred under the late Dr. Black's care in St. Bartholomew's Hospital in 1876, and is quoted by Dr. Dickenson. An indication may be afforded of the frequency of displacement of the colon from the fact that rarely a year passes that such a condition is not discovered in the dissecting-room at St. Bartholomew's Hospital, and it has been fully considered in a paper by my friend and colleague Mr. C. B. Lockwood.†

A renal tumour, as a rule, is detected as a swelling on the right or left side of the abdomen, as the case may be. It is firmly fixed posteriorly, and extends, if of large dimensions, from the lower margin of the ribs to the iliac crest. It pushes the intestines in front of it, gradually displacing the small intestines to the opposite side of the abdomen. This remark is true even of the duodenum, when the right kidney is affected. The transverse colon, however, usually maintains its position to the last, and can be detected as a resonant band lying across the tumour, and giving rise sometimes, when the hand is laid upon it, to a peculiar sensation, owing to the passage of flatus passed along it. Later on in the disease, the colon may be pressed against the abdominal wall, and the band of resonance disappears. In such cases, it has been suggested, in order to clear up the doubtful diagnosis, that air should be injected by the rectum; but I am not aware that this suggestion has ever been carried out. The rest of the swelling is absolutely dull to percussion, and does not, as a rule, fluctuate, but the sensation of fluctuation is often a fallacious test, as it may frequently be obtained in a rapidly-growing tumour. At times the surface of the tumour is irregular and nodular to the touch, but a readier and perhaps more important means of diagnosis is afforded by bimanual palpation, one hand being placed behind in the lumbar region and the other on the front of the abdomen. If an anæsthetic be employed at the same time to relax the abdominal muscles, probably no better method of diagnosis exists. In children, or thin adults, even the healthy kidney can be palpated in this manner with ease, and the very slightest enlargement is readily detected. This method has found able advocates in Sir W. Jenner* and Dr. Bright.†

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* See a case described by Dr. Fleming, "Dubl. Quart. Journ.," xliv, p. 235. N.B.—There is no means of distinguishing clinically the nature of the new growth, if we except the doubtful help to be derived from finding cancer cells in the urine.

† "St. Bart.'s Hosp. Rep.," Vol. xix, p. 255.

When hæmaturia is present, it is a sign of very great value, and its special and peculiar character should be observed with the greatest care. Unlike many other forms of hæmaturia, it is usually *very* profuse and *very* intermittent. Perhaps the very first symptom to which the patient's attention is drawn is violent hæmorrhage—he passes a pint of blood or more without any previous warning, and sometimes without any pain. The most careful examination of the genito-urinary tract will afford no indication as to its source of origin, and all goes well till a similar occurrence marks the gravity of the case. In rare cases the bleeding is so severe as to rapidly terminate the life of the patient, or it may appear early in the case and then vanish altogether, probably from the blocking of the ureter by the growth. More commonly, however, an examination of the abdomen will reveal some slight enlargement of one kidney, or, at least, an increased sense of resistance on one side of the abdomen, and a few months, or even weeks, will render certain what was previously a mere matter of supposition. If the hæmorrhage is at all severe, clots are certain to form in the bladder, and if they do not give rise to symptoms of renal colic, by their passage down the ureter, will only be expelled with considerable difficulty from the urethra, and may require to be broken up by the aid of a catheter before they can be passed at all.* In such a case other sources of urinary hæmorrhage must be eliminated before the true import of the case is determined. Hæmorrhage from the kidney may be due to injury, as we have already seen, but an injury, if not the cause of a cancer of the kidney, may, at any rate, be the first thing to give rise to hæmorrhage from the new growth. Several cases have first been brought into notice by some slight injury, and the hæmorrhage so often occurs after a prolonged and careful abdominal examination that the influence of external violence cannot be a matter of doubt.

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* "Lectures on Extra Pelvic Tumours of the Abdomen."—"Brit. Med. Journ.," 1869, p. 42.

† "Memoirs on Abdominal Tumours."—"New. Syd. Soc."

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* It has been suggested to try the effect of pepsine on clots in the bladder. I am not aware whether this suggestion has ever been carried out.

These facts are well illustrated by a case related by Spencer Wells.*

He first saw the case on Dec. 9, 1882, up to which time the patient had several severe attacks of hæmorrhage, which had seriously affected his general health. A removal of the growth was advised. Three days later the patient was losing so much blood that his medical attendant wrote to Spencer Wells recommending that the operation should be done with as little delay as possible. It is hardly possible to doubt, when one compares the clinical history of such a case with that of similar ones, that the manipulation necessary for an accurate diagnosis very materially contributed to produce the attack of hæmorrhage in question.

Other sources of renal hæmorrhage are stone, and the various forms of Bright's disease. Dr. Samuel West† has drawn attention to the difficulties of diagnosis which may attend renal hæmaturia,‡ and

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[*] "Med.-Chir. Trans.," Vol. lxvi, p. 305.

[†] "Lancet," July 18, 1885, p. 104, "On the Occurrence of Blood in the Urine in Granular Kidney."

[‡] For other points in diagnosis. *vide* Chapter IX, "Hæmaturia."

refers to a case in which the bladder was sounded, and in which it was proposed to dilate the female urethra and make a digital examination of the bladder. For some reason this latter procedure was not carried out, and the patient died a few weeks later from granular kidney. The hæmorrhage from stone is seldom if ever so large in amount as that of cancer. It is usually accompanied by severe pain, which is generally absent in the early stages of cancer, when the only difficulty in distinguishing the two affections is likely to occur. The passage of a calculus, either with some previous attack or accompanying the hæmorrhage, will help to clear up the diagnosis, but it should never be forgotten that cancer may supervene in a kidney which has given rise to symptoms of renal colic, as a result, perhaps, of the long-continued irritation to which it has been subjected.

A careful search should always be undertaken in cases of renal hæmaturia for cancer cells with the microscope; but they are rarely, if ever, to be detected, and the similarity in appearance between such cells and those of the transitional epithelium of the pelvis of the kidney and ureter renders such a means of diagnosis of doubtful value.

Moore has published a record of a case* in which he succeeded in detecting the presence of cancer cells in the urine which was found in the bladder of a man who died of renal cancer, but such a fact, even if established beyond doubt, would afford but little assistance where it is most needed, viz., in the early stages of such affections.

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* "Medico-Chir. Trans.," Vol. xxxv, p. 466.

Next to hæmaturia and the presence of a tumour, pain is often of much value. A dragging pain in the loin, either in front or behind, or anywhere in the region of the kidney, is sometimes observed, and it shoots sometimes down the ureter, and even into the thigh and testicle, but unlike the pain in so many affections of the kidney it is unaccompanied by retraction of the testicle (Roberts).

Other symptoms, such as diarrhœa, constipation, gastric disturbances, jaundice, or anasarca, though they often occur in company with the cancerous cachexia in the later stages, can hardly be spoken of as diagnostic signs, for they never appear until the diagnosis is well established, and all hope of successful operative interference has long since vanished.

Uræmia has apparently never been noticed when one kidney only is affected, as the opposite organ is capable of undergoing a rapid compensatory hypertrophy, a fact to which both experimental evidence and operative interference abundantly testify.

DIFFERENTIAL DIAGNOSIS.—Allusion has already been made to some difficulties of diagnosis which occur in connection with the hæmorrhage from a renal cancer, but these are nothing compared with the mistakes which are liable to be made when hæmaturia is absent. There is scarcely any morbid condition that has given rise to so many errors of diagnosis. It is mistaken most commonly for enlargements of the neighbouring organs, such as the liver and the spleen; more rarely for enlargement of the ovary, or even of the uterus. For other affections of the kidney of a non-malignant character it is very likely to be mistaken; indeed, in the early stages of such affections any exact diagnosis is quite out of the question; but as more careful attention is devoted to the characters of renal tumours, these mistakes will doubtless become more rare. From enlargements of the spleen a renal tumour can generally be distinguished with fair ease if the bimanual method of palpation is resorted to, so that its *shape* and *connections* with the loin can be determined. With an enlargement of the spleen of such a size that it could be mistaken for a renal tumour the edge is generally readily felt; there is no colon in front of it, and it does not reach down as far as the iliac fossa; and, what is of far more importance, there are constitutional symptoms which point to its splenic origin. In any case of doubt the blood should be examined for an excess of white blood corpuscles.

If the right kidney be the one enlarged, it may be mistaken for an enlargement of the liver, but it can generally be distinguished from it by the fact that in its early stage at least the upper border of the kidney is distinct from the lower edge of the liver, which will probably be detected by a careful search. A coil of intestines between the two will probably yield a clear note to percussion, though as the growth increases and contracts adhesions to the under surface of the liver, this sign will gradually disappear. The position of the colon, if it can be detected, will be of the greatest importance.

From tumours of the ovary and uterus* such a growth may be distinguished by the fact that such tumours grow upward from the iliac fossæ; they are usually more centrally situated in the abdomen, and yield *a resonant note to percussion* in the flank, especially when the patient is turned upon her side. This latter symptom is never present in the case of a renal tumour. A remarkable instance in which such a mistake in diagnosis occurred is related by Dr. Greenhalgh.* In this case the tumour, which turned out after death to be of renal origin, formed a complication in two pregnancies, and the question of its removal was considered, but she died before the operation could be performed.

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* Cases are alluded to in Chapter V. in which an exact diagnosis was impossible.

The question of diagnosis from other kidney affections, such as hydatid, tubercular kidney, etc., will be considered when these affections are alluded to later on.

THE REMOVAL OF MALIGNANT GROWTHS from the kidney has now been so often practised with success that no doubt can be entertained as to its possibility, but the exact indications which should guide one in proposing such an operation require further consideration. The situation of the kidney, and the examination of the natural history of the tumours to which it is subject, brings out with great clearness the rapidity with which the neighbouring organs and tissues are involved, so that if such growths are to be removed at all, it can only be in their early stages that any operation should be attempted. There are as yet no statistics available by which the duration of life with and without operation can be adequately compared, but it must be conceded at once that the cases are but few in which an operation has yielded good results. It has already been mentioned that sarcoma in childhood and carcinoma in the adult above fifty form the great majority of kidney tumours.

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* "St. Bartholomew's Hospital Reports," Vol. i, p. 85.

In children, the growth often advances with extreme rapidity, and the duration (Roberts) varies from ten weeks to about a year, whilst the mean duration is little over six months. Considering of how little avail an operation proves in the arrest of sarcoma when it invades other parts of the body in children, which parts are readily got at, it can hardly be expected to yield a better result with so deeply seated an organ as the kidney. Out of sixteen children, between the ages of sixteen months and seven years, who have been operated on, seven recovered from the operation and nine died. Of the seven who survived the operation, Godlee's case * died from recurrence of the growth in six months, Kœnig's, Bardenheuer's, Jessop's, and Hicquet's in four, five, nine, and eighteen months respectively. Of the remaining two cases there is no further record. Thus it appears that only one case, Hicquet's, survived longer than might have been expected without operation, whilst nine died in consequence of the operation itself. The percentage of deaths due to the operation itself will undoubtedly diminish, as further experience is gained, but no skill can add to the duration of life after it, and unless

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* Further particulars and opinions on the subject will be learnt from a perusal of the discussion on the subject at the Clinical Society, Oct. 24, 1884. See "Brit. Med. Journ.," Nov. 1.

further success is noted in this direction such operations must be abandoned, unless other considerations should demand their performance. If hæmorrhage should threaten the life of the patient, as it did in Spencer Wells's case, or extreme pain demand surgical interference for its relief, an operation may be advised in some cases, but too often these symptoms only supervene when all possibility of removal has long since gone by.

REMOVAL OF KIDNEY FOR SARCOMA IN ADULTS.—The records of removal of sarcomata in the adult are slightly better than the operations for the same disease in childhood. Provided only that the disease can be operated on early, there is every hope of a certain percentage of success. Thus it appears from Gross's tables that five patients were well thirty-one months after the operation out of seven who recovered from it. Such an operation, therefore, is quite as justifiable as amputation at the hip joint for sarcoma of the femur. Both operations are grave, but in both a small percentage at any rate have a reasonable chance of the removal of the disease being in their case complete.

With carcinoma, on the contrary, the results are not so favourable, the tendency to implicate the lymphatic glands is greater, and the patients are attacked at an age when the powers of recovery from a large operation are no longer what they were earlier in life.

At present anyone who attempts to remove either carcinoma or sarcoma of the kidney in the adult must be prepared to find that he has, in certain cases, to abandon the operation, though, if attacked early, there is a certainty that some cases admit of the tumour being entirely removed.

The question of operation in such cases cannot be finally settled till further results of such operations are published.

CHAPTER IV.

PARASITES OF THE KIDNEY.

With the exception of the hydatid form of the Echinococcus, none of the parasites of the urinary organs call for direct surgical treatment.

THE DIAGNOSIS of these cases will be difficult or easy according to whether the parasite is or is not discharged with the urine.

When no cysts are present in the urine, the disease can only be distinguished by the presence of a tumour, probably of moderate size, in the region of the kidney. At first its nature is only a matter of conjecture; as it enlarges its cystic nature is rendered more and more evident, and it is probably mistaken for a hydronephrosis, or an ovarian cyst.

That it must attain a considerable size before attention is drawn to it is shown by the following case. A boy was brought into St. Bartholomew's Hospital, Kenton ward, under Mr. Savory's care, in 1876. He died a few hours after admission from the results of rupture of the stomach, and at the post-mortem an unruptured hydatid, about the size of one's fist, was found in his left kidney. I made inquiry from his friends subsequently, but could not discover that his attention had ever been drawn to it during his lifetime.

It is as well to bear in mind that the position of the colon with reference to the kidneys varies more in the case of hydatids than in any other tumour (Roberts). This is probably to be accounted for by the fact that such cysts do not at first involve the whole kidney; having been carried by the blood current in their embryonic condition to the kidney, they are arrested in the capillaries, which are most abundant nearest the capsule, and so if carried to the outer side of the kidney, develop exterior to the colon, which will therefore be found on the inner side of the cyst rather than in front of it. But be the cause what it may, it is certain from the clinical history of the cases, which are quoted by Roberts, that the colon often lies on the inner side of an hydatid rather than in front of it.

The occurrence of hydatid fremitus when it can be obtained is a symptom of the greatest value. To obtain it in perfection the cyst wall must be very tense, and closely applied if not actually adherent to the body wall at the spot where the attempt is being made. Two fingers of the left hand should be placed upon the spot selected, and they should be sharply tapped with the finger ends of the right hand; a peculiar vibratory thrill, the so-called hydatid fremitus will be at once felt in the left hand. It is most essential that the left hand should be kept perfectly still for some seconds after the blow is delivered.

In many instances no fremitus will be detected at all, but fluctuation will be as evident as it usually is in an ovarian cyst.

When the cystic nature of the tumour is once determined by any of the means above mentioned, it requires to be distinguished from a hydronephrosis and an ovarian cyst.

From the latter it will be distinguishable by the resonance in the flanks, and, if it has been under observation for some time, by the fact that the ovarian cyst has grown up from the pelvic region. From a hydronephrosis it will be hardly possible to distinguish it, if no hydatid fremitus has been obtained, until a puncture, with a view to exploration, has been made.

The tapping, with a view to diagnosis, can be performed with an enlarged subcutaneous injection-needle, such as is now frequently employed in cases of pleurisy and other effusions, but, perhaps, the best method is that adopted by Roberts.* It is described by him in the following words:—† "I employ a tubular, gold needle, like the needle employed in subcutaneous injections, except that it is about twice as long. The base of the needle is mounted on a piece of rubber-tubing, three feet in length, and furnished with a small stopcock at its lower end. The tube is first filled with water by suction and the stopcock closed. The needle is then thrust into the most prominent part of the cyst, and the lower end of the tube is placed in a vessel on the floor. When the stopcock is opened the fluid begins to run, the column of liquid in the tube acting after the manner of a syphon, and exercising a soliciting force on the contents of the sac. The wound made by these needles is so minute that there is no risk of extravasation into the peritoneum, and certainly no risk of peritonitis, as I have tested in a large number of instances."

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* "Liverpool and Manchester Med. and Surg. Reports," 1873.

† "On Urinary and Renal Diseases," p. 646. Ed. 4.

There is a double advantage attendant upon this method of diagnosis. It is useful as well as a means of treatment. Several instances are recorded in which the hydatid cyst has after such treatment passed into a condition first of harmless existence, and finally into one of complete degeneration.

Some of the fluid which has been evacuated should be carefully preserved and examined; if it be a true hydronephrosis that the surgeon has to deal with, it will probably be characterised by a urinous smell, and have a specific gravity varying from 1,005 to 1,012.

It will almost certainly contain *some* albumen, probably a considerable amount, and from half per cent. to three-quarters per cent. of urea. If the fluid be that of an hydatid cyst, the hooklets should be looked for with a microscope. In order to obtain them it is best to place some of the thickest of the fluid in a conical glass, such as is ordinarily used for urine, and leave it to settle for some hours. If any hooklets are present they will be readily seen by taking some of the sediment from the bottom of the glass with a pipette. The presence of hooklets is, of course, pathognomonic. If they are not to be found the other characters of the fluid must be made out as confirmatory of the diagnosis. If the cyst be a living one, the fluid which comes away from it will, unlike that from acites, be transparent and colourless, and will not contain albumen and fibrinogen, which are invariably present in ascitic fluid. Its sp. gr. varies from about 1,009 to 1,014. Occasionally the fluid is a little milky; this is particularly likely to be the case with the last portion of the fluid when a large cyst is emptied. It usually contains a considerable quantity of sodium chloride. If the hydatid is already dead, putrefactive or degenerative changes will have begun, and the fluid will be somewhat discoloured, and perhaps mixed with pus.

It is, of course, quite possible that the cyst may be ovarian, or of some special form only determinable by an autopsy. The latter point will be guessed rather by the negative than by any positive signs which it may display.* The fluid of an ovarian cyst will display the following characters:—† If the cyst is simple and unilocular it will probably contain a perfectly colourless clear fluid, or it may be a little straw-coloured. Albumen is usually present, but in very slight amount, thus, as a rule, serving as a means of distinguishing ovarian from ascitic fluid. The latter cannot contain more albumen than the serum of the blood, but ovarian tumours usually contain much less. There are occasional traces of pus blood and sugar in ovarian tumours, and most contain that form of albumen known as paralbumen, which is soluble in twice its volume of boiling acetic acid. There is, therefore, chemically no absolutely certain means of distinguishing an ovarian cyst from one of a different nature in the region of the kidney, but it is rarely the case that the diagnosis is not materially aided by an examination of some of the fluid.

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* *Note.* A case is recorded in the "Archiv. f. Klin. Chir.," 1865, in which a hydronephrotic kidney was operated on in mistake for an ovarian cyst. A similar case is recorded in the "Berlin Klin. Woch.," vi, 1869. Other cases are referred to in the chapter on Hydronephrosis, p. 72.

† "Ovarian and Uterine Tumours," Spencer Wells, 1882, p. 91.

In a very large number of cases the hydatid is discharged spontaneously per urethram.* This may be the very first symptom by which the patient's attention is directed to the nature of his disease, or a welcome piece of confirmatory diagnosis by which the true nature of a doubtful tumour is at once solved. The clinical history of such a case is well illustrated by one, of which I have the notes, which was under my own care for a short time at St. Peter's Hospital for Diseases of the Urinary Organs in 1883.

J.P., age 39, came to the hospital complaining that for some years he had passed from time to time with his urine some bladder-like bodies. He brought some in a bottle with him. The bottle contained some putrid echinococcus cysts which he had passed that morning. He stated that about ten years before, as near as he could remember, he noticed his stomach was swelling; otherwise he suffered no inconvenience. Shortly after this he was seized with violent pain in his loins, which confined him to bed for several days, and he was obliged to call in the doctor. The pain was for several days very violent, causing what he described as cramp in the legs. A day or so after it commenced he passed with great difficulty and pain some bladders like those he has with him in the bottle; after this the pain gradually abated, the bladder-like bodies disappeared, and he got quite well. When he got up again his stomach was its usual size again.

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* A few cases have been recorded in which the hydatids passed per urethram did not come from the kidney. See Birkett, "Med. Times and Gazette," 1855, Vol. i, p. 161. Such cases can only be distinguished from those in which the kidney is affected by a careful examination of the abdomen and of those parts of the genito-urinary tract that can be reached.

Since that time he has had a repetition of the above symptoms about every year or six months, latterly more often still. For the last year or two the pain caused by the attacks has not been nearly so severe, and he has been able to do his work (that of a farm labourer) all the time.

He does not appear to be in any way affected by the passage of the hydatids, and is a strong, healthy man.

The present attack dates back about twenty-four hours.

EXAMINATION OF ABDOMEN.—There is a well-marked swelling about the size of a cocoa-nut, or larger, occupying the site of the right kidney. It is very readily detected by palpation. It is quite painless, and does not distinctly fluctuate, but is elastic. It is somewhat irregular in outline.

Three days later the man came again, and the tumour in the abdomen was then only perceptible to bimanual palpation. The discharge of hydatids had almost ceased. I explained to the man that no medicine would cure him, but that if he would come into the hospital the question of operation would be discussed. He elected, however, not to have anything done when he learnt that his attacks were not very likely to grow worse, and was to come back if anything fresh occurred. I have not seen him since.

Similar cases are quoted by Chopart,* Lettsom, and others; in some of these cases the symptoms lasted for twenty years; in one case (quoted by Béraud) for thirty-seven, and in some the final recovery is related. In many of these cases the discharge of the hydatids was determined by some special exciting cause, such as a blow or injury, and in one case by drinking spirits or strong coffee.†

TREATMENT.—When the symptoms which have just been described have been some time in progress, and do not in any way interfere with the health of the individual, or even scarcely inconvenience him, as was latterly the condition of things in my own case, it is perhaps the best treatment to abstain from any attempt to treat the affection by surgical means. When the urinary channels are enlarged, and accustomed to the passage of the cysts, it is extremely unlikely that the tumour will make its discharge by any fresh and more dangerous passage. If, on the contrary, the pain and inconvenience of the disorder is considerable,‡ lumbar nephrotomy, with removal, if possible, of the cyst wall, and washing out and draining the cavity, would almost certainly effect a complete cure, and the process should be one involving little, if any, danger to life.

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* Chopart, "Traité des Maladies des Voies Urinaires." Lettsom, "Memoirs of the Medical Society of Lond.," Vol. ii, p. 32. For other cases see Roberts, *et ib. cit.*

† "Schmidt's Jahrbuch," Bd. 116, p. 290.

‡ A case is recorded in the "Glasgow Med. Journ.," June, 1885, p. 429, in which a woman, age 30, died of advanced amyloid disease, only four months after the hydatids were spontaneously evacuated per urethram. Though this is only a single instance, it is sufficient to show that the evacuation per urethram must not be universally regarded as a signal to cease treatment. Each case must be decided on its own individual merits.

But the case is far different when the diagnosis is arrived at by any of the means above indicated, before spontaneous evacuation has taken place. Bursting is liable to occur into the lungs or peritoneum, and the cyst, by the enormous size which it attains, gives rise to considerable inconvenience, if not to actual danger to life. In certain rare instances the bursting into the kidney itself may be attended with death of the patient. A case is related by Dr. Blackburn * in which this took place, and in which the patient perished from the congenital absence of the opposite kidney.

In those cases in which treatment is called for, it should, of course, be directed towards the destruction of the cyst, and to relieving the symptoms of pressure to which it gives rise.

The methods of tapping have already been incidentally alluded to when the question of diagnosis was considered. If there are many hydatids floating in the fluid, it is certain that they will not pass through a small needle, or even through the largest sized tube which can be with safety applied to an aspirator. Under these circumstances a lumbar incision, with irrigation and drainage, will afford the best prospect of relief, and probably effect a permanent cure. The most that can be effected by tapping with a small evacuating needle is to draw off a certain amount of

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* "London Med. Journ.," 1781, p. 126.

the fluid, which leads in some instances to death and subsequent shrinking of the cyst. A case in which this mode of cure occurred was described in the "British Medical Journal." *

When the cyst has burst into the pelvis of the kidney, and sometimes even when it is intact, suppuration takes place in the sac, leading to the death of the hydatid. Such an occurrence is usually described as one of the methods of spontaneous cure; oftentimes, however, the remedy proves worse than the original disease, and the patient sinks from the exhaustion attendant upon the suppuration of so large a sac. Suppuration in the sac itself must not be confounded with the puriform, or even purulent matter which issues from the urethra when the periodic discharges of hydatids take place. This small amount of pus comes from the bladder, and is due to the temporary cystitis which has been set up. The onset of suppuration in the sac itself is usually ushered in by rise of temperature, shiverings, and the occurrence of pain, often of a very severe character, in the sac itself. When such symptoms have appeared there should be no delay in performing lumbar nephrotomy, washing out and draining the cavity as speedily as possible. Recovery, it is true, may take place without operation, but the dangers of neglecting to make a free opening for the pus are very considerable. The general principles of surgery must not be neglected, or set aside, because one or two patients have recovered in defiance of them.

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* 1877, Vol. ii, p. 471.

CHAPTER V.

HYDRONEPHROSIS.

THE TERM HYDRONEPHROSIS is, or should be, limited to those cases in which, owing to some obstruction to the urinary outflow, the kidney substance and its pelvis become dilated to form a cyst, which may vary in size from an orange upwards.

In the more extreme cases, at any rate, of this affection, the obstruction is usually limited to one ureter, and may be situated anywhere in its course. It is by no means necessary, however, that this should be the case ; it may be situated in the urethra, or even result from phimosis (James). As a rule, when the obstruction is situated anywhere in the urethra, both kidneys are equally affected, but this need not necessarily be the case, as is clearly shown by a specimen from the St. Bartholomew's Hospital Museum. There was a stone impacted in the prostatic urethra, but the right kidney alone was affected by hydronephrosis. The left was much enlarged, but healthy, the pelvis being *very* slightly dilated.

The term traumatic hydronephrosis has, as we have seen, been applied to those cases in which, after injury, a cyst has formed, the wall of which is derived partly from the kidney, and partly from the surrounding tissues. Such a cyst is not a hydronephrosis at all; it bears the same relation to true hydronephrosis as a ruptured traumatic aneurysm does to an unruptured idiopathic one.

If the ureter be obliterated by an injury then a true hyronephrosis may result, which differs in no sense from those which we are now considering.

Besides such cysts as these, paranephric cysts are recorded by Dickenson and others, and more fully alluded to by Morris.* Their pathology is not by any means clear, but they demand precisely the same treatment as hydronephrosis, from which, indeed, during life, they are usually indistinguishable.

PATHOLOGY OF HYDRONEPHROSIS.—The causes of this affection are to be found in some obstruction, external or internal, of the ureter, and for its production it is essential that there should not be complete obstruction. Just as the bladder and kidneys are dilated by the long continuance of a stricture of the urethra, and not by a sudden attack of retention, so it is to the long continuance of a partial obstruction of the ureter that we must look for the cause of that condition of dilatation of the kidney which is called hydronephrosis. If the ureter be completely blocked at once, as it is for example by a calculus in a case of obstructive suppression, the flow of urine ceases almost immediately, and the kidney undergoes atrophy without any dilatation whatever; if, however, the calibre of the ureter is only partially blocked, the urine passes away very gradually, and as the water pressure in the kidney is lowered more is secreted. The kidney is thus subjected to recurring pressure extending over a long period, its substance yields, and a large sac containing fluid (hydronephrosis) is the result, and this sac is in advanced cases little else than a mere shell containing no kidney secreting substance whatever. (*Vide* Plate XII.)

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* "Surgical Diseases of the Kidney."

Not unfrequently pus is formed in the sac, and pyonephrosis supervenes.*

Omitting those cases in which the ureter is pressed upon by a peritoneal band, an abnormal vessel gland or cancerous growth, or in which the affection is congenital, by far the great majority of cases are due directly or indirectly to the presence of a calculus in the ureter. A few cases are the result of a stricture of the ureter, caused very probably by the passage of a calculus or the contraction of a tubercular ulcer, whilst the remainder are produced by valve flaps of mucous membrane, bending of the ureter, or an obstruction at the entrance of the ureter into the bladder.†

The subject will be further elucidated by the accounts of some cases which have been recorded.

CONGENITAL HYDRONEPHROSIS.—A case of this nature is recorded by Rayer from Billard.* A boy, aged three days, was admitted into hospital with a large fluid tumour in the region of his right kidney. He lived about a month, and at the end of the time a post-mortem revealed a large cyst consisting of the dilated kidney. There was little or no kidney substance visible. The ureter could not be discovered at first at all, but after a careful search the lower end near the bladder was seen to be well developed, but higher up it vanished into a fibrous cord, showing no trace of a canal in its interior.

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* Whilst the above account seems to be borne out by all clinical evidence, it is only fair to add that experiment does not lead in all cases to the same conclusion. ("Progrès Méd.," No. 5, 1882.) In the experiment here referred to the ureter was tied, and hydronephrosis occurred, followed by atrophy and collapse of the kidney; nor is this result quite singular. Similar observations have been made by Charcot and Gombault.

† For a statistical table of the causes of hydronephrosis see Dickinson, "On Renal and Urinary Affections," p. 819.

The most remarkable of these cases, which has been referred to in every work on the subject, is that described by Glass, † in which the infant lived to be 23 years of age, and after death a cyst containing thirty gallons was found in connection with the right kidney, the left being natural.

HYDRONEPHROSIS FROM PRESSURE OF ABNORMAL VESSEL AND PERITONEAL BAND.—A very remarkable case of this kind is described by Roberts ‡ in which double hydronephrosis occurred: on the right side from the pressure of an abnormal renal artery which crossed the ureter just below the pelvis of the kidney, and on the left side an adhesion of the colon, and the obliquity of the ureter combined, which made the emptying of the kidney an impossibility, except when a considerable collection had taken place. When this occurred, the pressure of the pent-up fluid overcame the obstacle, and the kidney was emptied. The fluid that distended the kidney likewise pressed upon the colon, and gave rise to intestinal obstruction, which was the immediate cause of his coming under Roberts' care. No sooner was the kidney relieved by its urine passing off, than the intestinal obstruction likewise became relieved; but death occurred two days later from exhaustion, and the post-mortem revealed the condition above stated.

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* "Traité des Maladies des nouveaux-nés," p. 434. Paris.

† "Phil. Trans.," xliv, p. 337.

‡ "Urinary and Renal Disease," Ed. 4, p. 548.

Hydronephrosis from cancer of the bladder, or uterus, or from the pressure of a gland upon the ureter, is of not infrequent occurrence, but the patient usually dies too soon to allow it to reach any considerable magnitude: it is said never to have been observed during life (Morris). It was a case of tumour in the bladder, pressing on the ureteric orifice, that led Silbermann to devise his instrument for compressing the ureter. (*Vide* Chapter XII).

Pye Smith's case, in which the ureter was gradually obliterated from a horse kick, and in which hydronephrosis was the result, has been already alluded to under the head of injury.

HYDRONEPHROSIS FROM STONE IN THE URETER.—An excellent case of this kind, in which the patient died eventually from obstructive suppression of the opposite kidney, is mentioned by Rayer,* and quoted by Roberts. The patient first suffered at the age of 22 from bloody urine and pain in the region of the right kidney, but this entirely passed off, and he for many years enjoyed excellent health, dying eventually at the age of 64, after complete suppression for eleven days. A post-mortem revealed the right kidney converted into a large sac, and the ureter blocked by calculus some few inches from the pelvis of the kidney. The left kidney was red and swollen, and its ureter completely blocked by a stone, which was situated five inches from the kidney.

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* "Maladies des reins," Tom. iii, p. 490.

THE SYMPTOMS of hydronephrosis depend mainly upon the size of the sac. If it is small, and the other kidney is healthy, it may give rise to little, if any, inconvenience, and only be discovered at the post-mortem. Cases of this kind, if searched for, may be found in considerable abundance.* More commonly, however, it is clearly distinguishable as a renal tumour, presenting the general symptoms of such tumours which have already been detailed. The colon is situated in front of it, and it appears as a fluctuating swelling in the renal region. If, added to this, the fluid is suddenly evacuated per urethram, the diagnosis is absolutely confirmed.† A case of this kind occurred in the practice of my friend and colleague, Dr. Hood, at the West London Hospital, which I saw with him. A boy, æt. 9, came to the Hospital with a large tumour in the right loin. After careful examination, we came to the conclusion that it was a tumour of the kidney. It rapidly grew, almost filling the abdomen, causing distension of the superficial veins, and some difficulty of breathing. It was at this time supposed to be a

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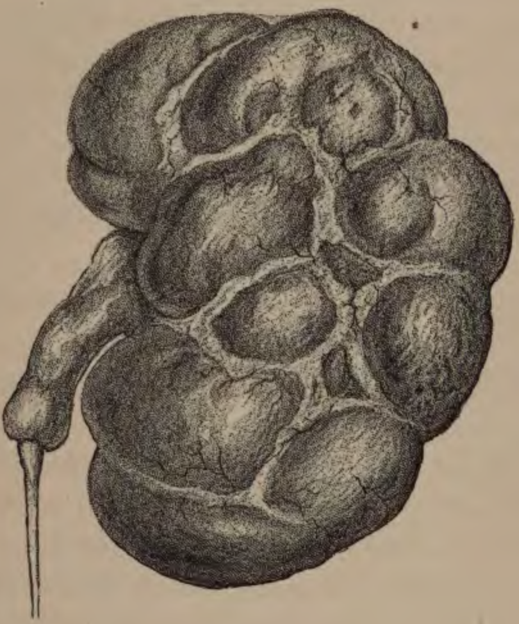
* "*Vide* Paper by H. Morris, "Med.-Chir. Trans.," Vol. lix, p. 236.

† For differential diagnosis of renal cysts and those of neighbouring parts, see last chapter. The subject is also dealt with in the subsequent pages.



HYDRONEPHROSIS.

(*Size* ¾).

T. M. GODART, DEL.

malignant growth, probably a rapidly-growing sarcoma, and the boy went home. A few months later his mother brought him to the Hospital, looking rosy and well. She stated that shortly after leaving the Hospital he had passed suddenly a large quantity of water, and from that time he got better. Some six months later he still remained well.

More rarely still the hydronephrosis is intermittent. Mr. Morris has described a case of this kind.* If this be due to the presence of a calculus, the re-accumulation of the fluid will probably be preceded by an attack of nephritic colic. As a rule, there is but little in the urine to indicate the nature of the trouble—perhaps a small amount of blood and pus at the time of the attack. A remarkable instance of this kind is recorded by Dr. Murray.† The hydronephrosis had in this case passed on into pyonephrosis. The subject of pyonephrosis is further considered in connection with renal calculus.

The patient, aged 57, had always been a weakly woman, but had enjoyed fair health to within three weeks of her death, when she began to get weaker than usual, and to vomit. The urine contained, when examined, a few pus cells under the microscope, and was not quite clear; the specific gravity was very low. After death two small stones were found, partly blocking up the pelvis of both kidneys, and the kidneys were dilated and reduced to mere pus bags.

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* "Med.-Chir. Trans.," Vol. lix, p. 227. Mr. Morrant Baker tells me that in the case described by him in the "Transactions of the Internat. Congress," London, 1881, this was also partially the case.

† "Lancet," Vol. ii, 1885, p. 614.

Such cases are liable, if the cyst is large, to be mistaken for ovarian cysts, and cysts of the broad ligament. In three at least of the cases in which death has occurred after nephrectomy, undertaken for supposed hydronephrosis, the post-mortem has shown that the cyst was ovarian or parovarian, and not hydronephrotic at all.

The difficulties of distinguishing ovarian and parovarian cysts from cysts in connection with the kidney has been alluded to in the chapter on hydatids of the kidneys. The aid that can be derived from an examination of the fluid contents of such cysts is also there discussed.

The following cases, which occurred in Martha Ward, and for which I am indebted to Dr. Mathews Duncan for leave to record, and to Dr. Collins for his notes, will illustrate very clearly some of the difficulties of arriving at an exact diagnosis in such cases.

S. G., æt. 32, married 13 years. Her abdomen has always been large. She has had a lump in her left hypochondrium 8 years, and has been an out-patient under Dr. Godson, suffering from what was supposed to be a floating kidney. At the present time there is a large fluctuating swelling occupying the right side of her abdomen. There is a band of resonance between it and the liver, but none in the flanks. Liver and splenic dulness are normal. Urine acid, contains urates, no albumen. Per vaginam, the tumour could be felt bulging by the side of the cervix uteri.

The tumour was tapped with an exploring syringe, and the fluid contained no cysts, but a considerable amount of cholesterin. It was quite clear. No diagnosis was arrived at. About a year later the patient returned with the tumour slightly larger. This time it was discovered to be hydatid after tapping, and was drained successfully.

This case is doubly interesting, presuming that the tumour which had been present for eight years and that which was eventually drained had been one and the same: first it was mistaken for a floating kidney, later on could not be diagnosed, and finally proved to be an hydatid.

Case II.—E. C., æt. 40, has noticed a swelling on the left side of her abdomen 2½ years, which has increased gradually, otherwise healthy. The tumour extends from the ribs to the middle of Poupart's ligament, and stretches at the level of the navel beyond the middle line. It is dull all over. Exam. per vaginam : Uterus high up, normal; has apparently no connection with the tumour.

The tumour was aspirated, and was found to contain about 4 pints of cloudy yellowish, beer-coloured, odourless fluid. Sp. gr. 1,014. The fluid is alkaline, and about one-half of it coagulates on boiling. It does not contain pus, blood, or hooklets when examined with the microscope. It contains 1 p.c. of urea.

A month later the tumour had scarcely begun to refill; there was a hard lump situated in its place towards the back of the abdomen. No certain diagnosis was made; the tumour was supposed to be a cyst of some kind in connection with the kidney on account of the urea which it contained, though at the same time the coagulation on boiling rendered its nature very obscure.

As we have already seen, the kidneys are able to resume their natural functions after hydronephrotic dilatation, provided only that the process has not gone so far as to cause absorption of the kidney substance. In Broadbent's case, for example, subsidence took place in a child 4 months old, and the child was known to be alive and well some time afterwards.

TREATMENT resolves itself into a removal of the cause and a palliation of the symptoms. As the cause can with no certainty be determined beforehand, the relief of the symptoms forms the main object of operative interference, though at the same time, if the pelvis of the kidney be carefully explored, there is always the possibility of removing the cause of the trouble, should that cause happen to be a calculus impacted in the upper part of the ureter.

If the hydronephrosis be but small it will call for little active treatment; but if it is large enough to give rise to inconvenience there is always the possibility of its bursting into the peritoneum, hence some form of active treatment should be decided. Gentle manipulation may lead, as it did in Broadbent's case, to dispersion of the tumour. But if it still persist as a source of inconvenience and trouble, the right course is to tap it, though such an apparently simple procedure has not in all cases proved to be devoid of danger. Peritonitis has sometimes supervened presumably from wounding the peritoneum, and from the escape into it of some of the contents of the cyst. With greater precautions the dangers of tapping will no doubt diminish. A timely incision would very likely have saved some patients whose deaths are now ascribed to the operation of tapping.

Cases in which death occurred are related by Simon[*] and another is described by Roberts.[†] From experiments made by Morris on the dead body,[‡] it would appear that the best place to select for the site of puncture is at a spot situated midway between the tip of the last rib and the crest of the ilium, about two inches posterior to the anterior superior spine. A trocar introduced in this situation, and directed slightly forwards, will pass in front of the kidney and just catch the dilated pelvis, whilst it is well behind the colon, and below the liver on the right side or the spleen on the left. When the pelvis of the kidney is thoroughly distended with fluid there is but little difficulty in finding the sac, which experience has shown *may* be repeatedly tapped without any danger to the patient. In a case related by Thompson, of Nottingham,[§] the patient was tapped almost in the situation above indicated with perfect success. After two tappings at intervals of more than a year, the patient completely recovered, and was able to do his ordinary work for more than eight years before he again came into Mr. Thompson's hands, when he died from peritonitis caused by rupture of the sac into the peritoneum. Another case is related by Coghill,[||] in which one tapping let out nearly five pints of fluid, and the patient made an excellent recovery without a second tapping. In such cases, where there is no post-mortem, there must however always remain a certain element of doubt as to the nature of the cyst.

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[*] "Berlin Klin. Woch.," vi, p. 23, 1869. Simon.

[†] Roberts, "On Urinary and Renal Diseases."

[‡] "Med.-Chir. Trans.," Vol. lix, p. 242.

[§] "Path. Trans.," Vol. xiii.

[||] "Brit. Med. Journ.," Feb. 6, 1875.

Tapping from in front, though sometimes attended with success, as in Hillier's * case, is a more dangerous operation, and it is also worthy of note that, in both of the fatal cases before referred to, the tumour was supposed to be ovarian; of course, therefore, no precautions were taken to get into the tumour behind the peritoneum, which doubtless would have been the case had its true nature been diagnosed earlier. Aspiration by the loin has never been attended by a fatal issue (Gross). Other instances have already been alluded to † in which cases of hydronephrosis after injury have recovered after repeated tappings. But this is not always the case. If the tumour refill over and over again, and still more if it give rise to symptoms of constitutional disturbance from extreme tension, or from the formation of pus (pyonephrosis), tapping must be supplemented by further surgical interference. It can either be drained or the kidney removed as a whole. There are a considerable number of recorded cases to guide us as to treatment, though some of these are due to injury, and not idiopathic in their origin.

But there are records of more than twenty cases in which the trouble was not the result of traumatic causes, and in which the operation of nephrotomy was per-

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* "Brit. Med. Journ.," April, 1865.

† *Vide* "Chapter on Injuries of the Kidneys," p. 16.

formed; and in more than half of the cases that recovered a urinary fistula remained behind some time after the operation. Some cases apparently suffer but little inconvenience from the fistula, either from the fact that but little urine is secreted by the diseased and partially-destroyed kidney, or because it has been possible so to adapt an apparatus to the loin as to avoid all inconvenience from the escape of the urine. This was the case with Morris' patient, who is stated by him "to pass about ten ounces daily, and to suffer neither discomfort nor inconvenience."* But in a case recorded by Taylor † the edges of the sac were stitched to the abdominal wall, and urine was passed through a glass tube, causing much inconvenience to the patient.

It is difficult, if not impossible, to conjecture beforehand how much inconvenience a patient will suffer from an urinary fistula; but if it should make life intolerable, there is always the remedy of nephrectomy, which in kidneys that have been already drained, and when the amount and character of the urine from each kidney can be easily and accurately determined, is an operation not attended by any very serious risk.

It has been resorted to in two cases only, viz., by Le Dentu ‡ and Spiegelburg, § showing conclusively that the inconveniences resulting from nephrotomy were not sufficient in most cases to warrant a subsequent nephrectomy. And this point is even more clearly brought out by a further examination of the two cases in which the major operation was performed. Le Dentu states that nephrotomy was only undertaken because the pain was intensely acute, and there were symptoms of perinephritic abscess. The pain was much relieved by this operation, but subsequently an abscess made an opening for itself in the groin, and a fistulous track resulted. Partly from this cause, and partly on account of severe recurrent attacks of inflammation in the site of the old wound, nephrectomy was performed, resulting in a complete cure, with relief from all troublesome symptoms. It appears then that this case was certainly not a simple case of hydronephrosis at all, but rather accords with the symptoms which one might expect to be produced by a renal calculus, or any other source of pyonephrosis.

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* Morris. This case is quoted by Gross. I have not been able to find the original reference.

† Taylor, *loc. cit. antea.*

‡ "L'Union Médicale," Nov. 17, 1881.

§ "Nieren Extirpation wegen Hydronephrose und Späterer Nierenbecken Bauchfistel." "Jahresbericht d. Schles. Gesellschaft," f. Vat. Kult., 1881, Breslau, lviii, 61, 62.

Spiegelberg's case was a true hydronephrosis, and a second operation for the removal of the kidney proved that the cause of the affection was a valve at the commencement of the ureter. The patient made a good recovery.

In some instances the secretion from the drained kidney, though not sufficient to give rise to much trouble by its amount, is capable of forming a deposit of urinary salts in the site of the old sac, which gradually contracts, and eventually closes altogether. My friend Mr. Morrant Baker informs me that this occurs periodically with a case of hydronephrosis described by him.* Since 1881 the boy has returned several times complaining of his side, and Mr. Baker has completely relieved him by enlarging the wound and removing a mortary mass which had collected in the cyst. This mass requires less frequent removal than formerly, and probably before long complete and permanent obliteration of the cyst will take place.*

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* "Trans. Internat. Med. Congress," 1881, Vol. ii, p. 264.

But if most cases of hydronephrosis that are treated by drainage eventually result in a successful issue, this is not the case with all. No less than four cases are known to have died from the effects of the operation, giving a mortality of 16 p.c. (Gross). But it must be borne in mind that these deaths include cases where drainage has been attempted from in front, and others in which the diagnosis was undetermined at the time of operation. With diagnosis perfected, and the operation rendered easier by the results of experience, such a table of mortality should and no doubt will be reduced considerably.

With so many disadvantages attendant upon nephrotomy, it is small wonder that attempts have been made to avoid all further difficulties by removal of the cyst as a whole.

If it is necessary to assert that no operation for nephrotomy should be undertaken unless the patient, if not absolutely in danger, is suffering from considerable inconvenience which cannot be removed by aspiration, it is far more necessary to make a similar assertion before undertaking the far graver procedure of nephrectomy, for the difficulties of removing so large a cyst are great, and the chances of peritonitis being set up by the escape of some of its contents into the peritoneum are considerable. No less than five out of a total of twenty-one cases recorded by Gross died from that cause alone, whilst three died from shock, in some of which it seems probable that peritonitis played no insignificant part.

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* Since writing the above I have had the advantage of seeing the patient. He has had no operation performed for nearly a year, and is perfectly well and strong. There is a very faint urinous smell observable in the sinus if the nose is applied close to it, otherwise none.

If the cyst be a large one, it is quite certain that no abdominal wound, still less one in the lumbar region, would suffice for its extraction without first evacuating the contents. The cyst, be it remembered, is tense, and fixed firmly in all probability to the back of the abdomen, so that there is little chance, if the abdominal incision be adopted, of getting its contents out with an ovariotomy trochar without some of the fluid escaping into the peritoneal cavity, whilst, if the operator prefer to attack it from the lumbar region, there seems no good reason why a preliminary nephrotomy should not be first practised, leaving the major operation to be adopted later on if required.

All these difficulties were present in a case which was operated on by Savage,‡ and finding it impossible with safety to remove the cyst as a whole, and tie the pedicle, he was at last forced to pass a wire clamp round the cyst after he had tapped it, and then was obliged to leave a considerable piece of the cyst behind to slough so as to prevent the slipping of the wire. Eventually, it is true, the patient made a good recovery, but only after braving the dangers of a suppurating stump for nearly three months.

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‡ "Lancet," 1880, Vol. i, p. 601.

From Gross' tables it appears that there have been twenty-one cases of nephrectomy performed for hydronephrosis, of which thirteen recovered. Since the publication of his paper eight cases more at least have been published, of which three have died, making a mortality of about thirty-five per cent.

Such a record is hardly encouraging in view of the safer procedure of nephrotomy, which it is clear should be adopted wherever there is no indication to the contrary.

CHAPTER VI.

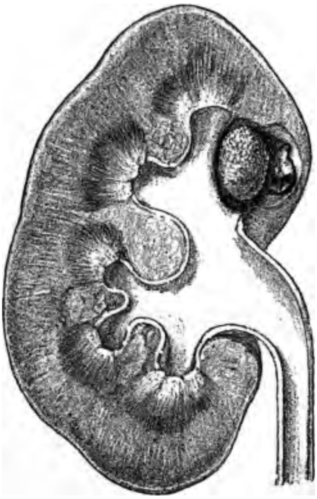
CALCULUS IN THE KIDNEY AND URETER.

It is impossible to form any idea of how many cases of calculus in the kidney should be submitted to operation, and of the means by which those that are suitable for operation can be distinguished from those that are not, without briefly referring to the general clinical history and pathology of such cases.

Stones may originate either in the uriniferous tubules or in one of the calyces of the kidney. If they form for themselves, as is sometimes the case, a permanent and closely fitting bed, they may increase indefinitely in size without their owner even being aware of their existence. One of the most remarkable stones of this kind is preserved in the museum of St. Bartholomew's Hospital. It is probably the largest renal calculus on record, yet it was only discovered quite accidentally at a post-mortem, the patient being admitted for pleurisy.

More often, however, a calculus which is formed in the kidney gives rise by the pain which it causes to symptoms of constitutional disturbance; pathological changes take place in the kidney, and the patient succumbs to the effects of exhaustion. But this is by

Pl. XIII.



CALCULUS IN THE KIDNEY.

(Size ½). Stage I.

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no means always the case, and it would appear from a table published by Dickenson [*] that only one-third of those who die with a stone in the kidney can be said to have died as a direct result of it. Such a table is, however, not so valuable without further details as it at first sight appears to be. Stone in the kidney is not always a primary affection by any means. A cancerous kidney, or one containing an hydatid cyst, may give lodgment to a calculus.[†] Such cases have already been referred to. It would be far more interesting to know in how many of the cases in Dickenson's table there were any symptoms of stone during life. A table which would give an answer to this query would be invaluable for the surgeon, who seeks to ascertain which those cases are that will be benefited by an operation. I have endeavoured to solve this question by examining the post-mortem records of St. Bartholomew's Hospital for eleven consecutive years, viz., from 1874 to 1884. During that time twenty-four kidneys containing stones were discovered; eleven of these had well-marked symptoms during life and thirteen had not. But there is another and perhaps a surer way in which the need for operation may be gauged, a way which is not open to the retort that the omission of a history of the symptoms of renal calculus in the notes must not be taken as evidence that such symptoms did not exist. What is the effect upon the kidney which is produced by the lodgment of a stone in its interior for any length of time? Pathology affords a clear and decisive answer upon this point. In almost every instance in which a renal calculus is found post-mortem, the kidney has undergone considerable fibroid change in the neighbourhood of the stone; * whilst if the stone has reached any considerable size the thickening is not even limited to the kidney substance, but spreads to the perinephritic tissue, causing it to condense, and in a later stage still suppuration takes place, first in and then around the kidney, and the pus makes its way into the loin, the groin, the pleura, and lung, or into the peritoneum or bowel.† (*Vide* Plates XIII. and XIV.)

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[*] "Renal and Urinary Affections," p. 916.

[†] A case is recorded by Dr. Wickham Legge in "St. Barthol. Hosp. Rep.," Vol. xii, p. 256.

Such facts afford ample justification for operative interference, and at as early a period as possible.

THE DIAGNOSIS of renal calculus is very often not attended by much difficulty, especially when the stone has reached a fair size, but the symptoms of a stone in the kidney must be carefully distinguished from those which are caused by the passage of a stone down the ureter. The intense paroxysms of pain, the retraction of the testicle, the irritability of the bladder, and the relief which is experienced when the stone has dropped into the bladder are too well known to need more than a passing allusion here. But their significance must not be overlooked, for a history of such symptoms on

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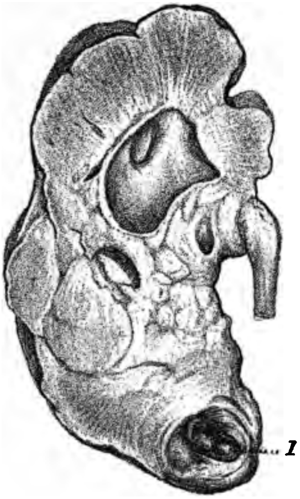
* See remarks on this subject by Knowsley Thornton, "Med. Times and Gazette," 1885, Vol. ii, p. 10. He remarks on the hardening which could be felt in a case in which he performed nephrolithotomy with complete success.

† For cases in which such terminations took place see *Bright*, "Memoirs on Abdominal Tumours" (New Syd. Soc.), p. 227; *Stanley*, "Med. Times and Gazette," 1854, Vol. ii, p. 343; *Hullett Browne*, "Path. Trans.," Vol. xiii, p. 131.

Pl. XIV.



CALCULUS IN THE KIDNEY.

(*Size ½*). *Stage II.*

1. Stone.

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a previous occasion may serve to convert the probability of a renal calculus into an almost absolute certainty.

The principal symptoms by which the presence of a calculus in the kidney may be inferred are pain, hæmaturia, the presence of pus in the urine, and irritability of the bladder. In some cases one symptom is more prominent, in some cases another, or more rarely still they are all in existence.

PAIN.—The character of the pain is usually dull and aching rather than the acute pain of renal (ureteric) colic. It radiates down often into the testicle,* and causes its retraction. The testicle in some cases which have come under my observation is even painful to pressure, and is stated occasionally to undergo atrophy. Dickenson † records a case in which the pain radiated down as far as the sole of the foot, the patient describing his sensations "as if the sole were raw and being rubbed with scouring paper." In other cases most of the pain is referred to the inner side of the thigh, the buttock, or the loins, following, in fact, the distribution of the cutaneous branches of the lumbar plexus.

In rarer instances the sensation of pain may be transferred to the opposite side of the body, so as to leave a doubt in the surgeon's mind which kidney was affected.‡ The severity of the pain varies enormously;

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* Mr. Butlin has recorded a case, "Chir. Trans.," Vol. xv, in which neuralgia of the testicle was one of the most prominent symptoms.

† "Renal and Urinary Affections," p. 919.

‡ See case described by Knowsley Thornton, "Med. Times and Gaz.," 1885, Vol. ii, p. 10.

it may be absent altogether, as in those cases which are not discovered till the post-mortem;* it may come on violently at first, and then disappear, giving place to hæmaturia, pyelitis, and pyonephrosis, or continue as long as the stone remains, confining the patient to his bed or house for weeks together and rendering his life a burden to him, or proving an exciting cause of insanity.† The dependency of attacks of pain on movement is a point that should always be looked for in suspected calculus. Accompanying the outbursts of pain, there are sometimes fits of colic, nausea, vomiting, purging, and various other reflex neuroses. If in company with these symptoms there is irritability of the bladder, a large increase of phosphates oxalates or urates at the time of attack with the presence of albumen in the urine, and perhaps of blood, even though it is only distinguishable with the microscope, the diagnosis is fairly certain. Occasionally the grating of renal calculi in the kidney can be detected on deep palpation,‡ and there is tenderness and an increased sense of resistance in the region of the kidney.

§ **HÆMATURIA** from the kidney is probably more often the result of calculus than of any other cause. It is, as a rule, easily distinguishable from the bleeding of a new growth by its scanty and oft-repeated attacks,

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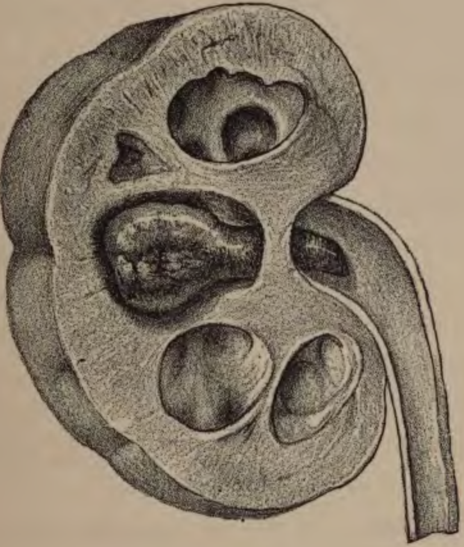
* A remarkable case of this kind is described by Murray, "Lancet," Vol. ii, p. 614, 1885. The kidneys were mere pus bags, and yet not enough pus had come away in the urine to attract any attention; in fact, there was no symptom of any moment till within three weeks of the patient's death.

† See case of Robert Hall, quoted by Dickenson, p. 921.

‡ See case recorded by Lucas, "Lancet," 1885, Vol. ii, p. 85.

§ For diagnosis of seat of hæmaturia and its significance, see Chapter IX.

Pl. XV.



Calculus in Kidney.

(*Size* ½). *Stage III.*

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whilst the bleeding from cancer is very large in amount and occurs only at intervals. If the bleeding is due to calculus it occurs chiefly during the day time, because it is dependent on movement, whilst it ceases at night because the patient is at rest.

The colour of the blood, too, is important; it is smoky or porter coloured, and contains often broken-up clots. If the urine is alkaline this is specially likely to be the case, whilst in rare cases a few epithelial casts may be present (Dickenson). It is as well to bear in mind that hæmaturia is occasionally associated with gout,* so that the presence of urates accompanied by hæmaturia and bladder irritation is by no means pathognomonic of renal calculus.

PYURIA,† though at first sight a symptom of great importance, is not by any means so characteristic of calculus as might be imagined. In the early stages of the affection there is often the greatest difficulty in distinguishing the symptoms of calculus from those of strumous kidney. In both there is irritability of the bladder, pus, lumbar pain, and blood in the urine, but the pus from tubercular kidney is *usually* granular and flocculent, and eventually settles at the bottom of a glass; whilst that which comes from a case of calculus pyelitis or pyonephrosis is thicker and more like the consistency of cream.

Bleeding is rare in connection with tubercular kidney, and the pain is seldom so violent as it is in cases of stone. In actual practice the distinction is very difficult, if not impossible, to make in all cases.

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* "Practitioner," 1875, Vol. xiv, 275.

† For diagnosis of seat and significance of Pyuria, see Chapter X.

Thus much, however, is certain; as will be seen when the question of operative treatment is discussed, that both demand exploration.

In some cases of tubercular kidney the presence of tubercle bacilli can be made out in the urine, but they are by no means always present in the early stage of the affection, and though their presence is a symptom of much value, yet their absence is no proof of the non-existence of tubercular disease.*

TREATMENT of renal calculus when the diagnosis is thoroughly established resolves itself into medical and surgical. Medical treatment is directed either towards a mere treatment of the symptoms, so as to render life as comfortable as possible, or towards dissolving the stone. This treatment, though it does not come within the scope of the present inquiry, yet certainly demands a more extended trial than it usually obtains.†

If no good result has followed this plan, and the symptoms of calculus are clearly established, there is no reason if the patient is healthy to delay the operation. If the patient is advanced in years, and not in a condition to undergo an operation that is not absolutely necessary, it will be wiser to resort purely to palliative measures. Such a case must be judged by the ordinary rules of surgery. As has been already shown by

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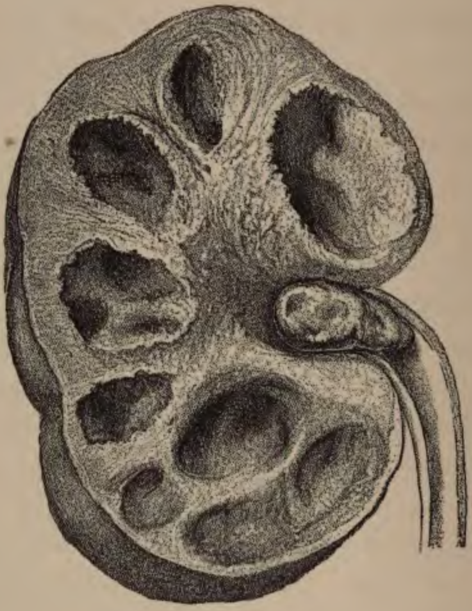
* For the methods to be employed for finding the bacilli, see Chapter VII.

† For a full account of it, *vide* "Urinary and Renal Disease," Roberts, 1885, p. 336.

Pl. XVI.



CALCULUS IN KIDNEY.

Stage IV.

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the consideration of the effects of calculus on the kidney, it is most important to remove the stone early, so as to leave behind a kidney which is in good working order, and not one which is in a condition of suppuration and has already undergone more or less fibroid change. It is in this particular that the modern operation of nephrolithotomy differs from the attempts which have been made from time to time by the older surgeons.

But there is another reason that may be fairly urged in favour of nephrolithotomy, and that is its safety. According to Gross's tables* twenty-one cases of the operation had been performed with two deaths. In Pepper's case death was due to an overdose of morphia, and in Cullingworth's to blocking of the opposite ureter with a stone. In this latter case the post-mortem revealed the fact that the kidneys were extensively diseased. Since Gross's paper was published there have been at least six or seven successful cases of nephrolithotomy recorded, including one in which a stone of nearly two ounces was successfully removed, so that the operation has now been performed close upon thirty times with only one death which was in any way connected with the operation. Moreover this case was more strictly one of ureterolithotomy than nephrolithotomy.† There are besides a considerable number of cases of exploration of the kidney for stone in which no stone were found, and none of these have apparently been followed by a fatal result. Such a record, considering that it includes the early pioneering cases, must certainly be regarded as a singularly brilliant one, and fully justifies the operation being undertaken at as early a period as possible.

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* "American Journ. of Med. Sciences," July, 1885, "Nephrectomy, its Indications and Contra-Indications."

† "Pathol. Trans." Vol. xxxvi, p. 278.

The various methods by which attempts have been made to remove stones from the kidney are fully detailed in Chapter XI, on kidney operations. It is only necessary here to discuss what principles should guide us in the selection of an operation. In view of the difficulty of getting at the kidney so as to explore it completely by the posterior incision, it will be preferable in most cases to select the lateral operation,* and, keeping outside the peritoneum, bare the front of the kidney. If no stone be discovered by the finger, it must be punctured freely all over by the method described in Chapter XI, in order to discover the stone. If the patient show any symptoms of collapse from the search, which may be a prolonged one, it will rest with the operator to decide whether he should proceed further that day or no. If the search is to be further continued, the pelvis of the kidney should be opened and the interior thoroughly examined with the flexible catheter, which is furnished with a nelaton probe end. If under these circumstances no stone is found the kidney might be washed out with a lithotrity evacuator, and if it is still the case that no stone is found it will be best to close the wound and abide the result. It is possible that the operation may have benefited the patient very considerably, if it has not relieved him entirely of his symptoms. If the symptoms warrant another operation, it will be best to perform the combined abdominal and lumbar operation, by which means both kidneys can be explored, and a more complete examination made of their entire surfaces.

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* There are conditions that might lead one to adopt a lumbar or abdominal incision to start with. The abdominal incision would be required for a floating kidney, and the lumbar for those rare cases where stones have been felt grating together from the outside of the body.

Some surgeons would no doubt prefer to perform this operation to start with. Knowsley Thornton, who was the first to introduce it, sums up its advantages as follows :—

(1). The presence of two kidneys can be determined for certain.

(2). It is impossible to operate on the wrong one.

(3). If there is a stone in the ureter it can be removed.

(4). It is easier to select the exact situation for an incision into the kidney.

(5). The kidney can be easily steadied and the stone removed more easily.

(6). The ureter and vessels can be more easily avoided.

Some of the advantages which are claimed for this operation can scarcely be regarded as of great importance. The principal considerations which warrant such an operation have already been referred to. It should be reserved for those cases in which from one cause or another the diagnosis is uncertain, and cases in which the kidney is movable.

But what must be done when the kidney has been most thoroughly explored by the methods just referred to, and still the symptoms are such as to render the patient's life unbearable? It must be confessed that our knowledge of the pathology of painful kidney is far from complete. In some instances the pain, it is true, is the result of stone, but this is not the case in all. Durham has recorded a case in which he removed the kidney in consequence of acute pain, and there was nothing found in it to account for the pain which the patient had suffered. Thus much, however, is certain, that if the pain be so violent as to place the patient's life in danger, or even to prevent him from earning his livelihood, the removal of the offending organ must be undertaken. This course was pursued by Morris* with perfect success. A small calculus deeply imbedded in the kidney substance was found after removal; but it is important to note that even after removal of the kidney the most careful palpation on its exterior failed to detect even the presence of the stone, still less its exact situation.

The same condition has led two other operators, Kosinski and Czerny, to repeat the same operation, and in both cases the patients made a good recovery, but no prudent surgeon would willingly sacrifice a healthy kidney till every plan had been tried by which the stone could possibly be detected. Morris has recommended incisions in various parts of the kidney, but it may well be questioned whether such a plan of procedure will reveal every stone that may be situated in the kidney, unless the organ be almost cut to pieces in the attempt. An examination of the interior of a kidney will show how many are the lurking-places in which the stone may be concealed. [*]

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* "Med.-Chir. Trans." Vol. lviii, p. 69.

But long before the removal of a stone from the healthy kidney [†] had been thought of, it had been the custom of surgeons to extract a stone from a kidney in a state of suppuration, or rather to incise a nephritic or perinephritic abscess, and extract a stone when it could be felt with a probe. A case of this nature occurred in the practice of the late Mr. Callender, and is recorded by him; [‡] but the patient died from exhaustion illustrated by a case published by Knaggs.* Suffice it to say that a fortnight's drainage had converted a dying woman into one who was quite free from immediate danger, and would be in an excellent condition to undergo at a future date, if necessary, nephrectomy.

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[*] With a view to testing how far it was possible to explore with a flexible sound the various recesses of the kidney, I made the following experiment, repeating it several times. I obtained an ordinary bougie à boule and had it furnished with a porcelain extremity like a Nelaton's probe. I dipped the sound in a 5-grain solution of silver nitrate, after washing out the kidney with a solution of salt so as to rid it of all the mucus and slime which is generally found in greater or less abundance after death. I then carefully sounded the kidney, after having cut down upon it by the lateral incision which is described and figured in Plate II., and by which means ample room was obtained. All the recesses into which the sound entered were rendered milky by the formation of silver chloride, and when the kidney was subsequently removed and examined it appeared that nearly every part of the pelvis and calyces had been reached. This experiment was repeated several times over with an almost exactly similar result. At the same time it is only fair to add that a large-sized pea passed into the kidney through an incision in the pelvis was detected by the needle in a dozen experiments that were made, though in one case as many as ninety-six punctures with a fine needle had to be made before this could be effected. To what extent the kidney can be punctured during life without injury remains to be seen in the future. Until this has been determined it is impossible to ascertain what is the best plan of discovering a concealed calculus in the kidney. If it turns out during the performance of an operation on the kidney that the stone which is the object of search is impacted anywhere in the ureter, it must be removed in accordance with the principles laid down later on in this chapter.

[†] This remark does not, of course, apply to Marchetti's case, upon which much doubt has been thrown, but there are good reasons for accepting it as true. See paper by Downes, "Med. Times and Gaz.," Lond., 1885, Vol. i, p. 238.

[‡] "St. Bart. Hosp. Rep.," Vol. x, p. 151. Lithonephrotomy.

CALCULUS IN THE URETER.—Closely allied to the cases of renal calculus are those in which the stone in its attempted passage to the bladder is arrested somewhere in the ureter, and these cases, when they give rise to complete obstruction, demand urgently an incision in the loin to give vent to the urine.

The measurements of the ureter which are given on page 3 will readily explain the situation in which a stone is usually found impacted in the ureter. This subject is very fully discussed by Morris † in a paper in which he shows very clearly that stones are most usually impacted either at the upper or lower end of the ureter, and but rarely in the middle. There are, however, at least two other instances recorded of impaction of a calculus in the middle of the ureter besides the one mentioned by Morris. One is described by Roberts,‡ in which a thickening and obstruction was found in the ureter after death, in which case it seemed probable that the stoppage had been due to a stone. Another case is recorded by Rayer,§ in which a stone was found five inches below the pelvis of the kidney.

Amongst the symptoms by which such cases can be detected, there is usually a previous history of colic owing to the passage of stones ; and very probably, if a correct history is obtainable, there has been a previous attack in which some slight suppression accompanied by pain and malaise took place; but the symptoms passed off speedily, and the patient regained his health. Such an attack, if rightly interpreted, is an almost sure sign that one kidney has been rendered useless by the blocking of its ureter.

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* "Brit. Med. Journ.," 1885, Vol. i, p. 432.

† "American Journ. of Med. Sciences," Vol. lxxxviii, p. 458, 1884.

‡ Roberts, Ed. 4, p. 36.

§ Tom. iii, p. 90.

The present attack has been ushered in by a similar attack, probably of colic, but this time there is complete obstructive suppression, though it is quite possible that it may yield *slightly* in a day or two, even though the attack should prove fatal at last. At first the symptoms are somewhat negative in character ; the patient is very restless and wakeful, but beyond a feeling of weakness and the suppression, there is little to draw attention to his case as being of serious import.

Later on, after seven or eight days or even later, muscular twitchings are observed, and the appetite now rapidly fails, the pupil gets contracted, and the mouth grows dry and parched. Coma, perhaps convulsions, supervene, and death speedily ensues.

If the foregoing symptoms are well established, and the patient is growing weaker, there is but little chance of the symptoms being removed by medical treatment. The obstruction can only be relieved by a timely incision.

It is obvious, from the situation in which stones have been found after death, that the surgeon, if he is to remove the stone at all, must be prepared to remove it either from the pelvis, the middle of the ureter, or its lower end. It would certainly be best to make an incision in the loin first, (except, perhaps, in the female, in which case the bladder should be first examined), find the kidney, and make a digital exploration of its pelvis. Should a stone be felt in this situation, an incision will at once give vent to the suppressed urine, and remove the stone. This operation has been performed only once, viz., by Lucas,* and the patient made a good recovery. It is very interesting to note that this patient had already had her right kidney removed for calculi and hydronephrosis, and further that it was several days after the second operation before she passed any water per urethram. It was even feared at one time that there might be another stone situated lower down in the ureter.

It remains, however, to be considered what should be done if when the pelvis of the kidney was explored no trace of a stone could be found. Under these circumstances, the catheterization of the ureter downwards, which has been already described, would at once reveal the whereabouts of the obstruction. It is easy to perform on the dead body, and could most probably be performed with equal ease on the living. Bougies à boule of various sizes are to be preferred for the purpose. Supposing a stone to be found some six inches down, or lower, far too low, that is to say, to be reached by the lumbar incision, there would be nothing for it but to open the abdomen, search for the ureter find its stone, and remove it, stitching up the ureter, again as has been done by Cullingworth. Whether the opening of the abdomen should be undertaken at once, or whether the kidney should be alone drained on the first day and the abdomen opened later on when the more grave symptoms had abated, must depend on the condition of the patient, and be decided in each individual case.

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* "Brit. Med. Journ.," 1885, Vol. ii, p. 884.

In Cullingworth's* operation the patient died owing to advanced disease of both kidneys, but the ureter wound remained perfectly watertight, and no peritonitis ensued. If the kidney were drained for the first few days the chances of extravasation would be probably *nil.* After performing abdominal section by Langenbuch's operation, he felt for the ureter belonging to the kidney which was enlarged, and finding it very tense, carried his fingers down towards the bladder till the stone could be clearly felt just above that organ. An incision was then made over it, it was extracted and a quantity of fetid pus escaped into the peritoneum, which was sponged out at once. The wound in the ureter was closed with some fine carbolized silk. The patient died a few days later from uræmia owing to obstruction of the opposite kidney, which was, as the post-mortem showed, the better of the two before its ureter was obstructed. In other words, it appeared that the ureter which was incised belonged to an almost useless kidney, and the ureter from the working kidney was not examined because the symptoms did not point to that side.

If a calculus is situated quite at the lower end of the ureter, it can, as has been shown by Morris,† be readily detected by a digital examination of the bladder, and it seems almost equally certain that it could be removed by an incision of the mucous membrane. In a conversation which I had with Dr. Cullingworth after he had shown his specimen (above referred to) at the Pathological Society, he told me that an examination per vaginam during life revealed two hard lumps, which he at first thought might be prolapsed ovaries, one on either side of the cervix uteri. It was not until the post-mortem that he discovered they were calculi impacted in the ends of the ureters. Rawdon has recorded a case in which he felt a stone in the ureter per rectum. In order to remove a stone in this situation which has been felt in any of the modes just mentioned, the index finger of the left hand must be held against it from the inside of the bladder, and with his right hand the surgeon will then introduce either a guarded bistoury or a lancet-shaped knife mounted on a long handle, such as Morris describes in his paper. Partly by cutting and partly by scratching, the stone must then be set free in the bladder and removed by forceps. If more room were required the urethra could be enlarged by an incision carried downwards into the vagina. It is far better to make such an incision and stitch it up at once than to over distend the urethra and run any chance of subsequent incontinence.

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* "Path. Trans.," 1885, Vol. xxxvi, p. 278.

† *Loc. cit.*

It is clear, then, that since it is quite possible, at least in the female, to detect the presence of a stone in the lower end of the ureter during life, a careful examination should certainly be made per rectum and per vaginam of the base of the bladder before attempting to perform nephrotomy for the relief of obstructive suppression.

In the male it would hardly be justifiable to submit the patient to cystotomy with the possibility of nephrotomy being required as well, but a rectal examination should certainly not be neglected. In the male the exploration of the bladder should only be undertaken as a secondary operation after the ureter had been sounded from above, and had displayed a calculus at its lower end, and probably after the kidney had been allowed to drain for several days from the loin.

Thus far Lucas's case is the only one in which success has crowned the operation of ureterotomy, Cullingworth's being unsuccessful, and Morris not having been allowed to make the incision which he proposed in the back wall of the bladder for the removal of the stone. Suggestions towards the same end have been made on previous occasions,* and there is no reason why a considerable measure of success should not attend such operations in the future.

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* See "Amer. Journ. of Med. Sci.," Aug., 1880. "Renal Calculi," R. F. Weir. Also "Brit. Med. Journ.," Dec., 1883, Vol. ii, p. 1095.

CHAPTER VII.

TUBERCULAR PYELITIS AND ABSCESS OF THE KIDNEY FROM OTHER CAUSES.

A kidney may be affected with tubercle in one of two ways. Either it is studded all over with miliary tubercles, which form as a rule only one small part of a general tuberculosis; or caseous masses appear, invade the kidney, and convert it into a mere abscess cavity.

PATHOLOGY.—When miliary tubercles are present they are seen as small millet seed bodies shining through the epithelium of the pelvis of the kidney, affecting the wall of the ureter, the bladder, and in fact the whole genito-urinary tract. If the stress of the tuberculosis has fallen on this tract and the patient does not succumb to phthisis, or any other tubercular affection of some distant organ, the miliary tubercles give rise later on to a series of small ulcers, which gradually coalesce to form larger ones, and the patient succumbs in a longer or shorter period, the post-mortem revealing a genito-urinary tract which has been almost entirely denuded of its epithelium, whilst in some parts, perhaps in the bladder or kidneys, the ulceration has spread much more deeply. In other cases, the tubercles are seen rather to be affecting the connective tissues, and the epithelium itself has escaped.

SYMPTOMS.—In the early stage of this affection there are few, if any, symptoms which afford a true key to its nature. The patient is perhaps noticed to be failing in health without any very obvious cause until attention is drawn to his urine by alterations in its quantity or character. A careful examination with the microscope reveals some *débris*, and albumen is present in larger or smaller amount. Occasionally some blood is passed. Perhaps an examination of the genito-urinary tract will reveal a roughened bladder, hardened and thickened vesiculæ seminales felt per rectum, and some nodules along the epididymis and spermatic cord. Such a series of symptoms would be sufficient to indicate the probable extent of the disease, and would at once render it clear that no operative interference should be thought of.

THE PATHOLOGY OF SCROFULOUS PYONEPHROSIS is different from that of the miliary affection. As already stated, it invades the kidney alone as a rule. The pyramids or some other portions of the kidney are attacked by caseous infiltration, probably as a result of some localized miliary tubercles which have not shown any tendency to become generally disseminated. These caseous masses soften, ulcerate into the pelvis of the kidney, and discharge their contents down the ureter. If the patient is strong enough to bear the strain, the kidney is in time completely destroyed, and a harmless encapsuled caseous mass is all that remains to tell the tale of what has been.

More rarely still, the ulceration is arrested and cicatrizes, and the remainder of the kidney continues to secrete urine. Not unfrequently the disease which has started in one kidney involves secondarily other parts of the urinary tract, and the disease no longer confined to one spot, speedily terminates the patient's existence.

DIAGNOSIS AND SYMPTOMS OF SCROFULOUS PYONEPHROSIS.—In its earlier stages, as has been already mentioned, when referring to the subject of renal calculus, it is very liable to be confounded with that affection, if, indeed, it is possible in all cases to distinguish and separate clinically the two affections. In some instances the diagnosis is very easy ; the patient is weakly and feeble, and appears to possess a constitution which is quite likely to become a prey to tubercular disease ; or some other tubercular mischief has occurred before, and has been cured, or, at least, rendered dormant for a time.* In such a case the appearance of pus in the urine, accompanied by pain in the loins, perhaps confined to one side, is a very suspicious circumstance. The same symptoms, however, without any previous strumous history, might denote a stone in the kidney.†

For the following clinical history of a case from the Royal Free Hospital, in which the diagnosis of stone was at first made, but which later on proved to be a strumous kidney, I am indebted to my friend Dr. Samuel West.

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* On this point see Dickinson, "Renal and Urinary Disease," p. 801. He asserts that there are at least eight cases in which tubercular kidney is a result of general tuberculosis for one in which this is not so; but statistics vary much on this point.

† It must not be forgotten that it is quite possible for stone to coexist with strumous kidney. Such a combination, however, far from rendering an operation undesirable, affords a double inducement for its performance.

M. T., æt. 14, first came under Dr. West's care on May 20, 1884. Fair health; has been subject to fits of abdominal pain and diarrhœa. Present illness three months' duration. Lately several shivering fits, and has awoke in a violent perspiration, suffers from nausea, has vomited twice in last fortnight, and has lost a good deal of flesh lately.

Present condition: Emaciated, looks ill. Tongue dry and red. Pulse 120. There is a swelling on the right side of the abdomen in the region of the kidney. The swelling is dull to percussion. Dulness does not alter with position of the patient.

Urine varies from acid to alkaline, and has a copious white deposit which does not clear up with heat and nitric acid; sp. gr., 1025. Contains about $\frac{1}{10}$ albumen.

May 29.—The whole of the right side of the abdomen is tense and dull. Distinct fluctuation; no evidence of spinal disease.

She has suffered during the last fortnight from frequency of micturition. Urine thick, whitish, and offensive. Alkaline. Pus seen with microscope.

June 3.—Aspiration of swelling on right side of abdomen, in most prominent part. Fifteen ounces of greenish, stinking pus drawn off.

June 12.—Temperature runs up to 103 or higher at night, and down to normal in morning. The swelling has increased, and is now quite prominent to the right of the umbilicus. Pain has increased. The appetite has fallen off. There is now a considerable quantity of pus in the urine. As the child was rapidly getting worse an operation was decided on.

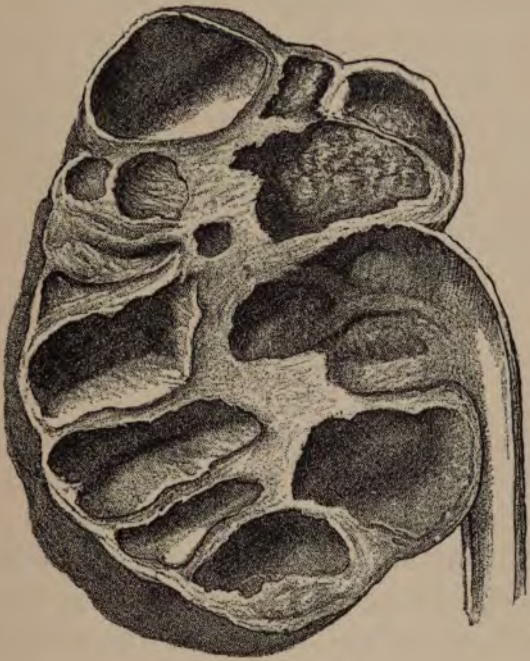
An incision was made in a vertical direction from the middle of the iliac crest upwards. When the peritoneum was reached it was stripped forwards, and the kidney at once exposed, and incised. A quantity of pus escaped, and no stone could be detected after careful examination. The wound was thoroughly drained.

The patient gradually sank, and died about a month later from exhaustion. A considerable amount of pus escaped daily from the wound until her death.

The post-mortem demonstrated clearly that the case was tubercular disease of the kidney, which was dilated to a mere sac, but little kidney substance remaining. (*Vide* Plate XVII.) There was no tubercular mischief in any other part of the body.

THE PRINCIPAL SYMPTOMS which accompany tubercular disease, in addition to the pyuria and pain in the loins, are the radiation of the pain to more distant parts, viz., the groin, the testicle, or the thigh, with occasional attacks of renal colic. It is, however, extremely rare to find the pain in the thigh or the attacks of colic anything like as severe as they are when a stone is present. I have not been able to find a record of a single case of tubercular disease of the kidney in which pus was not present in the urine at some stage or other. With abscess of the kidney, however, of a non-tubercular character, it is quite possible that this may occur, and the only evidence by

Pl. XVII.



STRUMOUS PYONEPHROSIS.

(*Size ½*).

T. M. GODART, DEL.

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which abscess can then be determined is the presence of a tumour in the situation of the kidney, which is painful to the touch, and conveys a sensation to other parts by radiation. Accompanying these symptoms there will be perhaps rigors, and rise of temperature, and an exploration puncture or incision will remove the last source of doubt. Why in such cases pus is not discharged with the urine it is difficult to determine; most probably it is due either to the fact that the abscess is perinephritic, or situated somewhere in the kidney substance, and not in connection with the ureter or pelvis of the kidney, and when it reaches the cavity of the pelvis the surrounding inflammation has already blocked its only mode of exit, viz., through the ureter.

Other symptoms pointing towards tubercular disease, in addition to those just enumerated, are pain about the neck of the bladder, with a frequent desire to urinate, this latter symptom indicating that the bladder is probably beginning to be affected. Oftentimes the symptoms are referred solely to the bladder, and the patient is sounded with a negative result, perhaps more than once, or it may be that there is a slight roughening to be felt in the bladder when it is sounded, denoting that the disease, if it has originated in the kidney, is not confined to that spot. But the presence of frequent micturition and pain in the bladder, though confirmatory of tubercular disease of the kidney, may easily occur without any disease of the bladder being present, and is presumably due to the *débris* and pus which has come down from the affected kidney, and which is most probably accompanied by alkaline and irritating urine.

Occasionally the discharge ceases after some time, perhaps after weeks or months, and, if so, it is said that in tubercular disease it does not return (Dickinson). The kidney may increase in size, but the ureter is blocked, and no more *débris* appears in the urine.

In the characters of the urine there is but little to draw attention to the nature of the malady. It may be acid or alkaline, usually the latter; it commonly contains some amount of albumen, and is rarely quite clear. Of late years attempts have been made to clear up the diagnosis of tubercular kidney by the finding of the tubercle bacillus,* but at present it has been discovered in so few cases that its absence cannot be regarded as any proof that tubercle does not exist. At the same time, where it is found, the diagnosis which was before a matter of probability is converted into an absolute certainty.

Before, however, passing on to consider what surgical treatment can and should be adopted in tubercular pyelitis, it is necessary first to glance at the clinical history and progress of such cases when treated merely by hygienic measures. There is, however, this difficulty in arriving at a true and just estimate of their course, viz., the difficulty of diagnosis, which, as we have just seen, is no small one. The diagnosis cannot be placed beyond a doubt in those very cases in which an accurate estimation of the value of symptoms is most needed. This is well illustrated by a case which is quoted by Roberts * from Dr. Todd.

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* Rosenstein and Babès were amongst the first to find the bacillus amongst the urinary *débris* (see "Central. f. Med. Wissenschaft," 1883, pp. 65 and 145). In order to detect the bacillus, some of the *débris* which has been allowed to fall to the bottom of the urine must be collected with a pipette and smeared on a cover glass or two. The glasses must then be dried carefully either over a spirit lamp or in front of the fire, and placed in anilin magenta staining fluid, decolorized with a 25 p.c. solution of nitric acid, and then immersed again in methyl blue. The tubercle bacilli will appear stained red on a blue ground. So far, though I have examined a good many cases, I have only detected the bacillus in one case, and that an advanced one, where the diagnosis was already sure. Koch, in his researches, relates that he found the bacillus abundantly in four cases of tubercular kidney, but was unable to find the bacilli in the pus voided per urethram; but after cultivation of the pus so obtained, tubercle bacilli were discovered in abundance (see Mittheil, B. ii, 1884). I have not yet had an opportunity of applying this method myself.

A female, age 25, unmarried, had been passing pus with the urine for at least twelve months before coming into hospital, and had suffered from a pain in the loins for the past five years, which often varied in intensity, but never had entirely disappeared. She had never to her knowledge passed gravel or calculus, nor did she seem ever to have had a pain in the direction of the ureter.

Rather more than a twelvemonth before her admission she had suffered from a sudden attack of retention, which lasted twenty-four hours, and immediately after this her attention was drawn to a sediment in the urine. Pus was passed at the time she came into Dr. Todd's hands to the extent of five or six ounces daily, and there was a large tender tumour in the region of the kidney.

Dr. Todd diagnosed a probable stricture of the ureter. Eighteen months later she presented herself at the hospital, having in the meantime spent a con-

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* Ed. 4, p. 516.

siderable time at Brighton. She said she was quite well; there was no pus in the urine, and no tumour in the side.

It is obvious that the diagnosis of this case must always remain a mystery, and however much it may be claimed as a case of cure of tubercular kidney, there can be no direct evidence that it was so; indeed, the very fact of its having undergone cure would by some be regarded as the strongest possible evidence of its non-tubercular character.

Roberts[*] remarks of these cases: "The prognosis is excessively grave, if not absolutely fatal. A hope of recovery can only be conceived to exist in those cases (if there be, indeed, any such) in which deposits are confined to one kidney without implicating the excretory appendages. One does not see, *à priori*, why tuberculous masses in the kidney should not be evacuated by the urinary channels in the same way that similar masses in the lungs are sometimes evacuated by the bronchial tubes, provided the tendency to the deposition of tubercle be arrested."

Similar views are expressed by Dickinson and other authorities on the kidney.

I saw, however, a case with Dr. Norman Moore which appeared to be a well marked case of tubercular kidney in a child, in which the patient had gained a stone in weight in the previous two months, and appeared to be much improving in health. There was a tumour in the left loin, and the urine had for the past nine months contained a considerable amount of pus. There had

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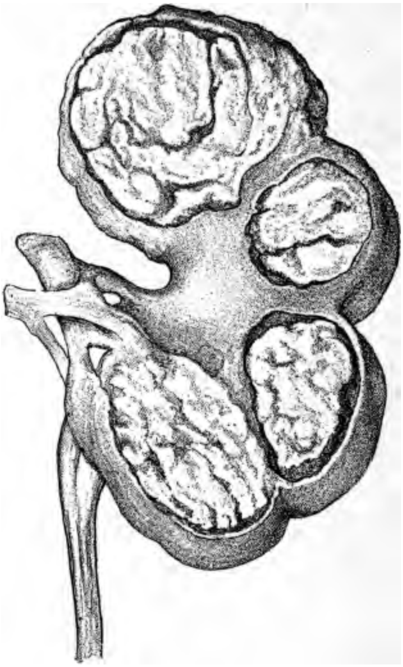
[*] Ed. 4, p. 623.

Pl. XVIII.



SHRIVELLED KIDNEY CONTAINING CALCAREOUS MATTER.

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never been signs of the passage of gravel, or of a renal calculus, nor indeed had there been anything to draw attention to the] disease excepting the pyuria and general emaciation, with loss of appetite. Nor is the evidence derivable from museum specimens more satisfactory. Kidneys filled with caseous mortary masses are occasionally found after death where no kidney symptoms have existed for years. A woman's kidney of this kind is preserved in the museum of St. Bartholomew's Hospital* (*vide* Plate XVIII), in which there had been no symptoms for at least twelve years before her death at 62 years of age. The tubercular nature of such specimens can be only affirmed when their *débris* have been ascertained to contain tubercle bacilli.

OPERATIVE INTERFERENCE.—It is quite clear from the above-mentioned cases which have just been referred to that the chances of recovery without operative interference are very slender.

In most, if not in all cases, death takes place either by the extension of the disease directly to the neighbouring organs, for example, the liver and the vertebræ, or to the subsequent occurrence of disseminated tubercle elsewhere in the body, or lastly, it may be due to general exhaustion from the effect of a long-continued wasting discharge.

Operations must, therefore, be directed towards the modification or entire removal of these conditions, and if they are to be attended by the greatest possible success shóuld be undertaken as soon as the diagnosis is well established. They obviously resolve themselves into free drainage of the offending kidney or its complete removal.

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* Series xxviii, No. 2337.

The question of drainage has been ably dealt with by Mr. Lucas* in a paper in which he advocates that nephrotomy should always be adopted in the first instance, leaving the major operation to be undertaken later on if necessary. Such a proceeding has much to be urged in its favour. It enables one at once to ascertain the secreting power of each kidney separately, and by relieving a patient of urgent symptoms, allows a more favourable time to be selected for nephrectomy if it does not remove the necessity for its performance altogether.

There is no affection of the kidneys that comes under the hands of the surgeon which so imperatively demands that the state of each kidney should be known before undertaking a nephrectomy as does tubercular pyelitis. Statistics† show that about half the cases of this affection are bilateral, and it is quite possible that the attempt which is made to remove the source of trouble may result in removing a kidney, which, however little secreting power it may possess, is at any rate the only one which is of any use, the other having been previously destroyed. An interesting case of this nature is described by Cole.‡ An operation had been determined on for the purpose of removing a suppurating tubercular kidney, but the very day beforehand the patient was taken suddenly worse, and died a few days later, when it was discovered that the kidney to which all the symptoms pointed was the only working kidney which the patient possessed, the other one having been previously destroyed by a similar process.

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* "Brit. Med. Journ.," 1883, Vol. ii, p. 611.

† See Dickinson, "Renal and Urinary Diseases," p. 803, *et seq.*

‡ "Brit. Med. Journ.," Aug. 5, 1882.

In favour of nephrectomy, on the contrary, it may be urged that if the operation be successfully accomplished, the patient, if free from other tubercular foci, has as good a chance of permanent recovery as one who has a leg removed for strumous disease of the knee joint, whilst the chances of death from exhaustion after drainage are at once removed. In the case which was referred to in the early part of this chapter, death supervened from this cause, and the post-mortem revealed the fact that the affected kidney was the only organ at fault. A similar case is recorded by Barker.*

There remains the difficulty of ascertaining the secreting power of each kidney separately. This can only be done either by employing one of the apparatus described (*vide* Chapter XII), or by preliminary drainage.

Examination of both kidneys from the inside of the abdomen can hardly be recommended, and would quite possibly not give the required information, for the size of a kidney is no proof of its secreting power.

If future experience should show that any of the apparatus in question is really of practical use, a great advance will have been made in the possibilities of kidney surgery. If this is not the case, it would be better to perform nephrotomy first, and as soon as the relative value of the two kidneys had been determined, either to decide at once upon the performance of nephrectomy or to wait and watch the curative results of nephrotomy.*

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* "Lancet," 1885, Vol. i, p. 141.

The after treatment of such cases is fully discussed under the head of operations (*vide* Chapter XI).

ABSCESS OF THE KIDNEY FROM OTHER CAUSES.—It has already been incidentally stated that difficulties in diagnosis present themselves as to the nature of certain cases of suppuration in the kidney. In the diagnosis of such cases it is usually easy to ascertain that the kidney is the source of the pus, but by no means easy to determine what it was that gave rise to the suppuration. Some such instances have already been alluded to under the heads of Calculus, Hydatids, and Injury. Besides these, there are the so-called cases of Surgical Kidney, in which the suppuration is secondary to disease of the bladder, prostate, or urethra. Such cases are not amenable to direct operative treatment, nor are the small localized abscesses† in the substance of the kidney which are due to septic absorption, and are usually only discovered on the post-mortem table.

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* In a paper entitled, "Chirurgische Erfahrungen über die Tuberculose" ("Deutsch. Med. Zeit.," 1885, No. 30, April 13), Volkmann discusses fully the value of surgical interference in Tubercular Kidney, and throws some doubt on its advantages. It must be confessed, however, that some of his remarks are too much dependent on theoretical considerations of the spread of tuberculosis, and too little derived from clinical experience. This question can hardly be satisfactorily solved until the diagnosis of tubercular disease has reached a more accurate pitch than it has hitherto attained to.

† A case in apparent contradiction to this statement is published by Southey ("Clin. Soc. Trans.," Vol. i, p. 58), in which an abscess of the kidney, the result of prostatitis and stricture, was opened by Holden, and the patient made a good recovery. This, however, was not a case of suppuration spreading up both ureters, but of a single abscess in a patient whose kidneys were presumably sound.

There still remain the cases of pyonephrosis, which are due to Childbirth, Floating Kidney, Gout, Gonorrhœa,* irritable drugs, such as cantharides, and other causes, best included under the head of *"Cause unknown."* Some, at least, of these abscesses start in the substance of the kidney, and only make their way down the ureter at a later period. The instances of abscesses in connection with childbirth are probably due, in some cases at least, to pressure upon the ureter by the gravid uterus, and must be treated upon the general principles of surgery. If after delivery the discharge threatens to affect the health of the individual to a serious extent, and shows no signs of yielding to medical treatment, the kidney must be aspirated or drained, and, as a last resource, removed. In some instances, such cases have been tapped successfully with a trochar. Dowse † has recorded such a case in which the pus disappeared from the urine after tapping an enlarged kidney from the loin. After a few days it returned, but was completely cured after a second tapping.

Suppuration in a floating kidney is by no means a common occurrence, but such a case is recorded by Dr. Andrew and the late Mr. Callender.‡ The patient in question first attended as an out-patient, complaining of pain in her abdomen. This, on examination, proved to be due to a tumour, which was diagnosed as a floating kidney. The pain became worse, and she was admitted into the hospital. Rigors came on, and pus appeared in the urine. Callender pushed in a trocar through the front of the abdomen, and evacuated some pus. The hole was then enlarged by incision, and finding that the two peritoneal surfaces were not adherent as was expected, he secured their adhesion by suture, and put in a drainage tube. She left the hospital all but well, and was subsequently lost sight of. Another case, for which no assignable cause could be discovered, is recorded by Southey,* and was opened by Thomas Smith. The symptoms and treatment of such conditions differ in no way from the preceding. Some such cases may possibly be due to perinephritis, and will be considered next.

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* *Vide* Dickinson, "Renal and Urinary Disease," p. 661.

† "Med. Times and Gaz.," 1874, Vol. ii, p. 632.

‡ "St. Barth. Hosp. Rep.," Vol. ix, p. 211.

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* "Lancet," 1873, Vol. ii, p. 772.

CHAPTER VIII.

PERINEPHRITIS.

It is impossible to enter *fully* into the question of Perinephritis; but the subject must, to a certain extent, be considered, because it often results from mischief in the kidney itself, and is liable to be mistaken for an abscess in that organ.

PATHOLOGY.—Perinephritis is an inflammation of the tissues which surround the kidney, of the fatty covering in which the kidney rests, and of the surrounding adjacent structures. In rare cases it results only in an inflammation of those parts, and does not pass on to suppuration.*

Those cases in which there is a swelling of the loin following some sort of injury, have already been alluded to under the head of kidney injuries, and the question of the inflammation, partly renal and partly perirenal, which ensues has been fully considered. So also has the thickening of the perirenal tissues which accompanies renal calculus been referred to, but inasmuch as the inflammation which ensues under these circumstances is most typical of perinephritis, it is desirable to recapitulate the condition which is revealed by a post-mortem.

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* Gibney, "American Journ. of Med. Sciences," 1877.

Surrounding the kidney, and firmly adherent to its capsule, is a thickened mass, hard as cartilage, cutting like cartilage, varying in thickness from half an inch to an inch, and attached to and intimately blended with the surrounding tissues and organs. Leading away from this hardened tissue are other patches of hardened connective tissue, which pass down into the pelvis, perhaps to the base of the bladder, into the iliac fossa, up to the diaphragm, and surround sinuses which may open anywhere in the side, or even into the lungs and pleura, thus affording the pus which is formed an opportunity for escape. It is to avoid such a condition as this, which, when it occurs, is well-nigh incurable, that timely operation is called for.

Besides this great class of cases in which the perirenal inflammation is secondary to kidney trouble, there is a second class in which this is not the case. The inflammation or abscess, as the case may be, arises either from some other source of irritation in the genito-urinary tract, such as stricture, stone in the bladder or orchitis,* or it may be the result of inflammation starting somewhere in the neighbouring parts of the digestive tract, or finally may be quite idiopathic.

The prognosis is always grave. Such cases rarely undergo spontaneous cure from the bursting of the abscess externally, though this does occasionally take place, as in a remarkable instance witnessed by Rayer, in which the patient, after suffering the most intense pain in the neighbourhood of the kidneys, evacuated one morning a large quantity of pus by the lungs, after which he made a speedy and excellent recovery.

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* A remarkable case is described by Chopart ("Maladies des voies Urinaires," Paris, 1821) in which a perinephritic abscess occurred after removal of the testicle for cancer.

More often, however, the patient is not so fortunate, and death results. A case of the kind is recorded by Turner.* A lady, after returning from a ride, in which she got very hot, sat in a draught, after which she felt considerable pains in her back, and suffered after supper from what she imagined to be indigestion, vomiting her food. This was partially relieved by an emetic and a purge, but she was seized two days later with violent pains in the back; the next day symptoms of collapse came on, and she died in the afternoon—a post-mortem revealing a mass of gangrenous tissue, passing on in some places to suppuration, surrounding both kidneys, which mass had spread to the tail of the pancreas, causing it to be similarly affected.

DIAGNOSIS AND SYMPTOMS.—The symptoms of this affection vary greatly in accordance with its severity, its duration, and extent. Quite recently † attention has been drawn to a class of perinephritic affections in which suppuration does not occur, and the symptoms have been detailed by Gibney at some length. This class of case has, however, been before described, though somewhat more briefly, by Trousseau.‡

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* "Med. Trans.," published by College of Physicians, London, 1813, Vol. iv, p. 226.

† Gibney, "American Journ. of Med. Sciences," 1878.

‡ "Clinique Medicale," Tom." iii, p. 766.

At first there is but little to draw attention to the seat and nature of the trouble, but the pain in the loins, which is gradually becoming more and more severe, and is yielding to no ordinary treatment, nor abating with the lapse of time,* at last forces its true significance upon the surgeon. The patient is, perhaps, unable to rotate his lumbar spine without pain, or the body is inclined towards the affected side, and slightly bent forward; or the thigh may be a little flexed upon the abdomen, to rectify which condition the pelvis is rotated and the tip only of the toes brought to the ground, as in an early case of hip disease. The pain radiates into all the regions which are supplied by the lumbar nerves. Most commonly it runs down to the groin, perhaps shooting into the testicle or affecting the knee, or it may be centralised in the gluteal region, and be confined to the back of the thigh. Added to the pain, there will very possibly be deep-seated fluctuation.

The constitutional symptoms are no less variable; it may run its course, as we have seen in Turner's case, within a few days, or, as in some of the instances quoted by Rayer and Trousseau, continue for months. In a case which was for a time under my care, in which the affection was secondary to a renal calculus, the abscess burst in the loin, and the patient survived the first attack for more than a year, though she was subject to repeated exacerbations, between which, however, she was able to do her ordinary work. The onset of the constitutional symptoms, it would appear, from the published cases, may be either gradual or sudden, and ushered in with rigors, high temperature, and general febrile disturbance, but unless the inflammation is secondary to a calculus or other renal trouble, there will be nothing, at any rate at first, to be discovered by an examination of the urine.

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* Morris records a case in which some weeks elapsed before the pus could be detected.

From a consideration of the above-referred-to symptoms, it is evident that the distinction of a perinephritic abscess from other affections of the neighbouring parts is hedged round with many difficulties, and these difficulties will be much aggravated when the disease is idiopathic and not secondary to some renal trouble.*

DIFFERENTIAL DIAGNOSIS.—It must be distinguished from any affection of the kidney, which will generally be effected by the normal character of the urine, except in those cases in which the urine has shown evidence of kidney trouble before the onset of the perirenal mischief. It will be usually distinguishable without difficulty from hip disease, though some authors have gone so far as to ascribe some of the recoveries from hip disease to a cured perinephritic inflammation. The mass of the pain, or, at least, the tenderness on pressure, will be situated round the kidney, and an examination under chloroform will show that the hip moves freely and easily, and that the tissues in its neighbourhood are not altered or thickened. From vertebral caries it will in some cases be difficult to separate it, but this can only rarely be the case, and the general course of the disease will before long make the diagnosis easier. At times it occurs as a consequence of inflammation in and around the viscera, as in a case described by Trousseau in which the inflammation started in the gall bladder and gave rise to a perirenal abscess, which was incised with a good result. Such a case might possibly be confounded with an attack of typhlitis, or perityphlitis, but even if it were the treatment would in no sense differ in the two conditions.

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* Some excellent remarks on this subject will be found in a thesis by Féron, Paris, 1860. "Thèse sur la périnéphrite primitive."

TREATMENT.—It is clear from a perusal of the cases referred to by Rayer,* Trousseau,* Gibney,* and Poland,† that these cases resolve themselves clinically in two great groups, first those in which the inflammation ends in resolution, and, secondly, the cases in which suppuration ensues.

The cases in the first group must be treated by leeches, by counter-irritants of various kinds at their first onset; later on by poultices and soothing applications of various kinds, and by rest in bed.

In the latter group it is essential as soon as there is any evidence of the formation of pus, that it should be at once incised. It is better to be too early, and to cut down and find no pus actually formed, than it is to wait till the pus has burrowed deeply and found its way to situations where it is difficult to evacuate. It is true that cases have occurred in which after much suffering, and the greatest danger to life, the abscesses have spontaneously evacuated themselves. An instance of evacuation through the lung is recorded, as we have seen, by Rayer, and one is mentioned by Dickinson in which the pus discharged itself through the kidney; but these cases are rather curiosities of surgery, which show what may be done under the most adverse circumstances, than beacons for our future guidance.

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* *Loc. cit.*

† "Brit. and Foreign Med.-Chir. Rev.," 1871. Further descriptions of such cases are given by Fenwick, "Lancet," July 25, and "Samml. Klin. Vorträge," No. 253. "Ueber paranephritische Abscesse."

Poland established beyond all possibility of doubt in his review of such cases that early incision gave the best chance of recovery; indeed, that were it only adopted early enough, recovery was almost certain, whilst to leave the abscess alone was to court almost certain death.

In the first instance the aspirator should be employed, and, as in one of Fenwick's cases, recovery may result without incision; but unless rapid improvement take place after aspiration there should be no delay in making a free incision in that situation where the inflammatory tissue would seem to afford the best chance of discovering pus.

CHAPTER IX.

HÆMATURIA.

It is by no means always easy to determine the situation from which the blood is derived when it is passed from the urethra. It may come from the urethra, the bladder, the ureter, or the kidneys.

HÆMORRHAGE WHICH IS DERIVED FROM THE URETHRA is, as a rule, very characteristic. The blood is passed independently of micturition, and there is generally some readily obvious cause to account for its presence; either the corpus spongiosum has been ruptured during sexual connection or in the course of an attack of gonorrhœa, or there is the history of injury or the impaction of calculus to account for its presence. Rarer causes will be found in phagedæna* or a malignant growth. But whatever the cause, the blood is red and quite unaltered, having been evidently discharged from the vessels just immediately before its appearance.

WHEN THE HÆMORRHAGE PROCEEDS FROM THE PROSTATE OR BLADDER, this is not the case; the blood usually remains some time within the bladder before it is evacuated, and there undergoes changes before it passes away with the urine. To a great extent these changes are determined by the amount of blood which has escaped. If the bleeding is but slight the blood and urine are intimately mingled and come away together, and the patient experiences but little if any pain; if the bleeding, on the other hand, be excessive, blood may collect in the bladder, clot, and give rise to symptoms of straining, discomfort, and considerable pain, rendering it necessary to break up the clots with a catheter, or even to perform cystotomy for their extraction. Oftentimes the blood has an alkaline reaction from the attendant cystitis. This reaction, if present, is a most valuable aid in diagnosis.

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* An interesting case of this nature which proved fatal is recorded by Cooper Foster, "Lancet," Vol. i, 1872, p. 888. The attacks of bleeding were independent of micturition, but their cause was not discovered till after death.

If not due to stone, such hæmorrhage will almost certainly be due to some form of tumour in the bladder or the prostatic urethra, or even to varicose veins in the latter situation.*

There is one symptom, however, which rarely fails to diagnosticate the presence of a bladder tumour, viz., the fact that the bleeding is almost invariably worse after the attempts which have been made to explore the bladder with a catheter or sound, and oftentimes the tumour can be felt per rectum.

BLEEDING FROM THE URETER so rarely if ever occurs, that if the site of the hæmaturia is neither in the bladder nor the urethra, it may be assumed, with a fair amount of certainty, to proceed from the body of the kidney or from its pelvis. But it must be borne in mind that blood which has proceeded in the first instance from the kidney is not unlikely to clot in the bladder, and so give rise to symptoms which will more or less simulate the characters of that bleeding which finds its seat in the bladder or prostate. Under such circumstances the diagnosis will be arrived at with as much certainty as is possible by bearing in mind that bleeding which has proceeded from the kidney rarely *exists long* without affording some indication of its original seat by lumbar pain of a more or less severe character, whilst vesical or prostatic hæmaturia, as has been already stated, is invariably aggravated by catheterism, which of course produces no effect on bleeding which has its site in the kidney.

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* I have myself performed a post-mortem upon a case in which the hæmorrhage from varicose veins was the cause of death. A similar case is recorded by Lacroix, "Journ. Hebd. d. progr. des Sciences et Inst. Méd.," Paris, 1835, ii, 65.

The diagnosis of renal hæmaturia is by no means easy to arrive at with absolute certainty. We may judge of the seat of the hæmorrhage partly by the fact that there is nothing which points with certainty to any other portion of the genito-urinary tract.

Bleeding from the urethra, as we have already seen, can hardly be mistaken, and if no symptoms of pain, of cystitis, tumour, or stone point to the bladder as the seat of trouble, attention is at once directed to the kidney.

There is one phenomenon which, when it occurs, is most characteristic of hæmorrhage from the kidney or its pelvis, viz., the expulsion of fine thread-like pieces of fibrin, which give one the impression that they have been moulded in the ureter, and subsequently expelled by the pressure of the descending urine. These clots are commonly of a whitish colour, and have the appearance of small worms at first sight. But whether or no these clots are present, the blood is generally very completely mixed with the urine, and often partly discoloured, whilst the corpuscles have lost their characteristic shape under the microscope. The typical porter-coloured urine of acute nephritis (Bright's disease) is so well known and so characteristic that it needs no special description. Sometimes, however, the blood is voided in considerable quantity, and is almost, if not quite, unaltered in its characters. It has come on suddenly without any warning, pain, or even inconvenience, in a patient just past middle life; or it may be the bleeding has been preceded by pain, which is of some weeks' duration. In such a case the symptoms would almost certainly point to malignant disease, and the presence of a tumour will set at rest the diagnosis. It must be borne in mind, however, especially if it is the right kidney that is affected, that no evidence of a swelling may be present until the tumour has made considerable progress. Only recently I have come across a case in which a careful examination under chloroform in a woman who was not fat failed to detect a tumour of the right kidney, which was seen four weeks later, on the post-mortem table, to be at least four times the size of a normal kidney, and in which intermittent attacks of bleeding had existed for over a year. The tumour had grown at the upper part of the kidney, and, being situated in the concavity of the liver, was quite out of reach to palpation at the time of the examination.

In early life, up to five or six years of age, renal hæmorrhage is almost pathognomonic of renal sarcoma, if the bleedings occur to any great extent; oftentimes, however, the amount of blood is insignificant in tumours both of the child or adult, and may even scarcely be sufficient to draw attention to its existence (Roberts).

With such variability in the amount of bleeding from a renal tumour, it is not surprising that the significance of renal hæmaturia, when it first appears, cannot in most cases be rightly estimated. If the bleeding is but slight, and is accompanied by much pain and uneasiness of one side, more particularly if the pain radiate down into the groin, or into the testicle, there is a strong presumption in favour of renal calculus. This presumption is converted almost into a certainty if there is a history of previous attacks of renal colic, or if the urine has been from time to time discoloured by gravel. If none of these conditions are present to aid in determining the cause of the bleeding, no exact diagnosis can be arrived at until some confirmatory evidence pointing to its true significance is forthcoming.

It must not be forgotten that, though renal hæmaturia in the adult generally implies the presence of a tumour or the existence of a stone, yet there are other and rarer conditions which, however unlikely they may be to exist, yet cannot be disregarded by a careful surgeon. In the chapter on renal calculus more than one instance is recorded of a fruitless search for the cause of renal hæmorrhage, and doubtless the unwritten records of surgery could bring to light many more.

Bleeding from the kidney may be an indication of some inflammatory condition of that organ; if so, it will be merely temporary in duration, and there will be other symptoms of general fever. If it be due to a blow there will be the history of injury a few days or hours previously. If the bleeding occur as the result of some organic change, as in the course of granular kidney, there will generally be the evidence of failing health and the characters of the urine to guide one in arriving at a correct diagnosis. When granular kidney, however, occurs, as it occasionally does early in life, there is a danger of the true significance of the hæmorrhage being overlooked.

In one case of this kind with which I am acquainted the propriety of operation was actually discussed, but the characters of the urine turned the balance against operating, and the post-mortem revealed the true nature of the case.

Another such case is recorded by Dr. West,* a woman under 25.

With such cases before one it is clear that no operation should be undertaken until the most careful examination of the urine extending over several days has been carried out and the general symptoms of the patient most carefully investigated, not omitting an ophthalmoscopic examination of the fundus of the eye, in cases in which there is any doubt.

Other causes of renal hæmorrhage are to be found in Purpura, the hæmorrhagic diathesis, heart disease, the administration of certain drugs, such as turpentine,

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* "Lancet," 1885, Vol. ii, p. 104.

Severe hæmorrhage is known to occur in the course of acute fevers, and a case is recorded by Sir Henry Thompson in which it invariably preceded an attack of gout * in one patient, and I have come across a somewhat similar case myself.

Added to these are those curious cases in which such hæmorrhage is caused by special mental conditions. One of the most remarkable of these is recorded by Basham,† in which hæmaturia always occurred in a man when his wife got drunk. Nor must the occurrence of paroxysmal hæmaturia be omitted, though a careful attention to the symptoms would always preclude the possibility of mistaking its real import.

All such conditions need only a bare mention, but it is more important for the surgeon to bear in mind that hæmorrhages may occur in connection with tubercular kidney, from the presence of hydatids or other parasitic worms (Roberts).

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* For a curious condition, probably of the same nature, in which renal hæmorrhage was produced whenever large quantities of intoxicating liquors were taken, see Fouquier, " Gaz. d. Hôp.," Paris, 1842, 2 S. iv, 157.

† " On Dropsy," 3rd Ed., p. 312.

CHAPTER X.

PYURIA.

The significance of pus in the urine, even when it is ascertained to have its seat in the kidney, is by no means easy to determine, whilst coming as it may from almost any portion of the genito-urinary tract, the difficulties of an accurate diagnosis are often very considerable.

The commonest, if not almost the only cause of pus arising primarily in the urethra is gonorrhœa, and as in the case of blood from the same situation, its independence of the flow of urine is quite sufficient to determine its site.

Pus from the deeper parts of the urethra and from the prostate, if the result of an acute abscess, will be detected by pain and a sensation of weight in the perinæum, in addition to the fact that it is passed separately from the urine.

If the urine is passed more frequently than it should be, and is accompanied by considerable irritation of the bladder, by pain, or by inability to hold water more than a few minutes, there can be little doubt that the patient is suffering at least from some form of cystitis, but there is no certainty what the cause of that cystitis may be. Supposing that no enlarged prostate, stricture, or stone in the bladder can be detected, the cause of the cystitis remains unexplained, and must be sought in some condition of the kidney or ureter, or may possibly be due to the discharge of pus from some abscess in the neighbourhood.

In the latter case the diagnosis will be a matter almost of conjecture, unless some direct evidence of such an abscess is forthcoming, which is rarely the case until that evidence is afforded by a post-mortem.

Suppuration in the kidney itself is usually designated by the name of Pyelitis, and if it be accompanied by some considerable enlargement of the kidney, by that of Pyonephrosis.

The symptoms which point most clearly to pyelitis are the presence of pain and aching in the lumbar region, tenderness, very possibly, on pressure in the same region, which is much aggravated if the method of bimanual palpation be adopted. The uneasiness will be confined to one side or extend to both, according to whether one or both kidneys are affected.

The constitutional symptoms will be determined by the acuteness or chronicity of the affection, and to a great extent will depend on whether one or both kidneys are affected. The presence of a small stone may give rise to grave constitutional disturbance and much suppuration. Suppuration may arise under the most varied conditions. It occurs, for example, as the result of the overdose of certain drugs, such as cantharides, during the course of acute fevers, pyæmia, typhus, etc., and sometimes even in Bright's disease. Such conditions, as a general rule, do not present many difficulties in diagnosis, and never call for direct surgical interference.

It is far different, however, when suppuration is the result of calculus or tubercular disease, or is dependent on the presence of hydatids and other parasites, or upon cancer or injury.

A calculus may be inferred from the character of the pain, which is often very severe, more especially if it be accompanied by bleeding, or if there has been a previous history of renal colic.

The differentiation of suppuration dependent on tubercle from that which is the result of a calculus is very often attended by considerable difficulty, but the age of the patient, and his aspect, and the character and amount of the suppuration, and the presence of tubercle elsewhere in body, may afford some indication. The presence of tubercle bacilli, if they can be detected in the urine,* is pathognomonic, but they are rarely to be found.

If hydatids be the cause of the suppuration, the presence of the cysts or of hooklets in the urine will render the diagnosis certain. In addition to this there will probably be a tumour in the situation of the kidney.

If the suppuration depend on a hydronephrosis which has become converted into a pyonephrosis, the course and history of the disease, and the presence of a tumour, which will vary a good deal probably in size, will render the diagnosis easy.

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* See chapter on Tubercular Disease.

Besides the causes of pyuria above enumerated there are cases in which the suppuration must be described for want of a better name as idiopathic. Examples of these cases have been described by Callender,* T. Smith,† and others. Under this head may be classed those cases of pyelitis which complicate pregnancy.

The treatment of such cases is referred to under the special heads of tubercle, stone, etc., and resolves itself in most cases into an exploration of the kidney by some form of lumbar incision.

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* "Suppuration in a Misplaced Kidney," "St. Bart.'s Hosp. Rep.," Vol. ix, p. 211.

† "Lancet," 1873, Vol. ii, p. 772.

CHAPTER XI.

OPERATIONS ON THE KIDNEY AND THE MODE OF THEIR PERFORMANCE.

There are four principal operations which are employed for the relief of renal troubles. These are **NEPHROTOMY,** or simple incision of the kidney; **NEPHRECTOMY,** removal of the organ; **NEPHROLITHOTOMY,** incision for the purpose of removing a stone; and **NEPHRORAPHY,** or the attachment of the kidney to the body wall in order to prevent its undue movement.

The operation of **NEPHROTOMY** * may either be undertaken from the loin or from the front through the peritoneum. When it is intended merely to drain the kidney, the lumbar incision is far preferable, as it affords a dependent opening and reduces to a minimum the chances of wounding the peritoneum.

The exact incision is a matter of indifference; the first plan which was employed was to make the same incision which is ordinarily employed in the case of colotomy, viz., to commence just outside the erector spinæ, about midway between the crest of the ilium and the last rib, and parallel with the latter structure.* Further experience has, however, shown that the kidney is better exposed by making the wound as near as possible to the last rib (*vide* Plate I).

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* The operations of nephrectomy and nephrotomy can best be considered together.

Some, again, use a vertical incision, some a horizontal, and others a little of each, or a semilunar cut so as to be able to fold back a flap, and thus expose the organ in question to a fuller view.

Amidst these varied plans there is but little to choose, and each surgeon will probably do best if he employ that plan with which he is most familiar.

The structures on the back must be divided in their order, the patient lying with a pillow under the belly and opposite flank so as to arch the back slightly, and being inclined slightly on the side. When the fascia transversalis is reached, it should be divided on a director, and the kidney at once comes into view. By gently separating the kidney from its surrounding connective tissue with the fingers the anterior surface can be thoroughly explored, and the whole kidney pulled outside the body and freely handled. Any suppuration in the kidney could hardly fail to be detected, and to make assurance doubly sure, a grooved needle or trochar may be employed, and passed into the substance of the organ wherever the surgeon may think it advisable to do so.

Suppose, then, it is decided to drain the kidney, it will have to be determined where the puncture should be made, whether through the kidney substance or in the pelvis of the kidney. The kidney substance is more usually preferred ; first, because it is easier to get at, and no harm is known to ensue from it, and secondly, because the pelvis is more difficult to incise, and when incised to keep drained. To make the incision through the kidney itself a tenotomy knife may be employed at first, and then a director pushed gently onwards till the pus or fluid in question is reached, after which the aperture may be enlarged with a pair of dressing forceps to whatever size the surgeon may think advisable. A good deal of free oozing usually occurs at first, but stops in a minute or two, after which an india-rubber or glass drain can be inserted, and the rest of the wound stitched up.

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* It is never advisable to remove the last rib, or even to approach it too nearly. The pleura sometimes extends below the last rib, and has been opened even in a colotomy operation. Several fatal cases of nephrectomy are due to wound of the pleura. "Conf. Czerny. Central. f. Chir.," No. 45, 1879.

Very often, however, when the kidney is reached, the steps which have been just sketched out are by no means easy to accomplish ; the operator finds himself embarrassed by tissues, which have been hardened by long-continued attacks of inflammation, and all attempts at separating the kidney from its surroundings, if not futile, are at least attended by no slight risk. Under these circumstances, if the kidney is to be drained at all, it *must* be drained by cutting through kidney substance, as the pelvis cannot be reached.

NEPHRECTOMY.—If it is tolerably clear that the patient is suffering from some tumour of considerable size, and that nephrectomy rather than nephrotomy should be performed, the abdominal incision is preferable to the lumbar for the reasons above stated.

An incision can either be made in the middle line of the body, commencing from about two or three inches above the umbilicus to two or three inches below it, according to the size of the tumour, or Langenbuch's incision to the outer side of the rectus muscle can be adopted. Whichever of these incisions be employed, the *modus operandi* differs in no way from such an incision performed for any other abdominal trouble. All bleeding vessels should be carefully secured before the peritoneum is opened.

The chief advantage to be derived from Langenbuch's operation consists in the better view which is obtained of the kidney in question, and in the fact that the peritoneum at the back of the abdomen is incised at the outer edge * of the colon, where there are but few large vessels, instead of on its inner side, where they are abundant. When the peritoneum has been stripped off the tumour in question, the growth should be carefully separated from the surrounding tissues, and the pedicle secured in accordance with the rules to be laid down in the succeeding pages.

If much difficulty is experienced in separating the kidney from its surroundings, care must be taken to avoid hæmorrhage; numerous catgut ligatures will be required, and it may even be necessary to employ the cautery, whilst, if the adhesions are very extensive, it may be necessary to abandon the operation altogether. Not a few cases are recorded in which the patient has survived a lengthy operation of this nature only a few hours,* whilst fatal hæmorrhage could in one case only be arrested by a ligature placed round the aorta,† which prolonged the patient's life for ten hours.

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* Incision on the inner side of the colon has been known to give rise to gangrene of the colon.

When the tumour has been safely removed, and the pedicle secured,‡ the advisability of drainage and the treatment of the cut peritoneum must be decided on.

If there has been much hæmorrhage, or many adhesions have been encountered, so as to lead to a probability of much oozing afterwards, there should be no hesitation in employing drainage, and no method is so satisfactory as that of making a small hole posteriorly for the drainage tube. A tenotomy knife, or any other similar instrument, will be found most handy for the purpose. If the kidney has shelled out without any trouble there is no need for drainage, any more than in an ordinary case of ovariotomy; but if there is any doubt in the operator's mind, it is far safer to drain than to do without drainage. In more than one case the operator has ascribed the loss of his patient to lack of suitable drainage. The following remarkable case in which recovery eventually took place is of the very greatest value in elucidating the proper mode of treatment of such cases.§ Mrs. C., age 34, was operated on for chronic pyelitis with a large renal calculus. Langenbuch's incision was employed, nephrectomy was performed, and the ureter was brought out of the lower corner of the wound after having been tied with a silk ligature. All went on fairly well for seven days, but on the eighth symptoms of intestinal obstruction set in, and no relief following treatment with enemata or puncture of the intestines through the abdominal wall with a fine trochar, it was decided to reopen the abdomen and search for the cause of obstruction. This was accordingly done, and after a prolonged search, a fluctuating swelling the size of a hen's egg was discovered close by the pedicle of the renal vessels. It was in close relation with the descending colon, and when opened discharged some most fetid pus. The bowel gurgled, and at once discharged its contents. Drainage was now employed, and in a day or two pus appeared in the urine. The external drain soon healed, and though the patient eventually recovered, pus was discharged by the bladder for more than three months.

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* Czerny, "Archiv f. Klin. Chir.," Bd. xxv, H. 4, p. 858.

† Czerny, "Central. f. Chir.," No. 45, 1879.

‡ The treatment of the ureter is referred to later on.

§ "Nephrectomy for Chronic Pyelitis, with Large Renal Calculus," J. W. Wright, M.D. "New York Med. Journ.," p. 178, 1883.

The treatment of the rent in the peritoneum through which the kidney has been removed is another point of great importance. Many surgeons have been content to leave it alone, trusting presumably to the edges of its serous surface falling together, and thus speedily shutting off the rest of the wound from the general peritoneal cavity. This occurrence does take place in many, if not in most, of the cases, but it has in exceptional cases led to various untoward occurrences.

Sir S. Wells has recorded* a case in which he thinks the death of the patient may have been due to the non-suturing of this part of the peritoneum, and he concludes by advising that in future the rent in the peritoneum should be sewn up. It has been shown by Spencer Wells in specimens, which are now in the Museum of the College of Surgeons, that when the edges of the peritoneum are not brought together in front after ovariotomy that a piece of intestine adheres to the wound, and peritonitis is liable to occur. Such a fact is an additional reason for suturing the peritoneum behind, and if necessary for draining the retroperitoneal cavity in which the kidney was situated.

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* "Med.-Chir. Trans.," Vol. lxvi, p. 305.

There is also some danger that the intestine may be strangulated in the hole. Such a case is recorded by Pugh.* Three days after an operation for the removal of a sarcoma of the kidney in a child, severe vomiting came on, and at the post-mortem three days later a piece of small intestine was found to be strangulated in the wound of the transverse mesocolon. Such cases afford ample evidence of the desirability of suturing the posterior peritoneal aperture, and with the wound cut off, as it must be, by such a procedure within a few hours from the general peritoneal cavity, drainage of the cavity in which the excised kidney lay is deprived of any harmful consequences, and would probably prove an unmixed benefit.

The abdominal incision must be united by sutures, taking care to bring the serous surfaces of the peritoneum together, and to pass the sutures through all the tissues of the abdominal wall. Separate catgut sutures may be employed for the peritoneum if it is thought advisable.

In many cases there is so much doubt in the operator's mind what condition the exploration may bring to light that it is necessary to be prepared either for incising the kidney, removing a stone from its interior, or excising the whole organ. Under these circumstances it becomes necessary to choose an incision which will answer all three purposes. The kidney must be reached from behind the peritoneum, so that it *may* be opened without injuring that sac, whilst there must be ample space to remove the kidney as a whole, and to expose, if need be, the interior of the peritoneum.

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* "Med. Press and Circ.," March 4, 1885.

The only incision which presents at once all these advantages is a lateral one (*vide* Plate II), which may be made semilunar, and should extend from about the tip of the tenth or eleventh rib to the crest of the ilium, with its concavity towards the spine. This may be best described as *the lateral incision,* and will be alluded to in the ensuing pages under that name. The structures should be divided in order till the fascia transversalis is reached, as in the *mid abdominal incision.* But if the fascia transversalis is divided, and an attempt is made to separate it from the peritoneum at this part of the abdomen, great difficulty will be experienced owing to the close adhesion which here obtains between these structures. It is, therefore, both easier and safer to strip back the fascia transversalis and the peritoneum together. The only difficulty which attends this process is encountered when the back of the abdomen is reached. If the operator is not extremely careful he will follow the fascia behind the quadratus lumborum instead of getting on to the front surface of that muscle, or the kidney may be lifted up with the fascia and the vertebral column reached, whilst the kidney itself is missed. But the knowledge that such mistakes are possible is a sufficient safeguard against their occurrence.

When once the kidney is exposed it can be separated as freely as need be from its surroundings, and a good view obtained of the pedicle. In those cases where the organ is much enlarged it usually comes into view as soon as the abdominal muscles are divided, as it has by its gradual enlargement separated the peritoneum from the side wall of the abdomen, leaving the fascia transversalis in close contact with the muscles.

It is possible that this lateral incision may prove after a more extended trial to be the best for most, if not for all, purposes of kidney exploration. A reference to the published accounts of the discussions on the kidney during the last few years will indicate the great differences of opinion that were expressed as to what was the best form of incision, and whether a kidney should be removed by abdominal or lumbar section. The fact is that the surgery of the kidney may be divided into two great classes: (*a*) comprising those cases in which pus is present in the kidney, and in which, therefore, there is a very considerable chance of septic peritonitis if the peritoneal cavity is opened; (*b*) including all those cases in which this is not the case, but where some tumour has to be removed. In these latter cases, unquestionably the abdominal method offers considerable advantages over the lumbar. First and foremost there is abundance of room, and the tumour can be readily seen, handled, and removed; the wound is a simple one, and it readily unites. The abdominal method, too, presents this further advantage, that it affords the operator an opportunity of making a digital examination of both kidneys, and of ascertaining with some degree of certainty whether both are capable of secretion. If the surgeon attempt to remove a good-sized tumour through the ordinary lumbar incision he at once finds himself cramped for lack of space, and the chances of his either not removing the tumour at all or taking with it a portion of the peritoneum are very considerable.

The following rule will therefore represent the present state of our knowledge of the subject. *For the removal of kidneys which are enlarged employ the abdominal or lateral method, whilst to evacuate pus, and perhaps for the removal of a stone, the lumbar incision is far the best.*

THE MANAGEMENT OF THE PEDICLE.—In cases of removal of the kidney it is most important to decide upon the best mode of treating the pedicle. It can be either ligatured as a whole, or each vessel secured separately, but the main point to decide is the treatment of the ureter. The question of the treatment of the artery and vein may be very shortly dismissed. It is evident from the published records of operations that the ligature of each vessel separately has few if any advantages over ligature *en masse* or piecemeal.* It is perhaps impossible to determine for certain which method is preferable until the pedicle is actually exposed. Perinephritic inflammation and adhesions may, and probably will, determine the advisability of ligature *en masse* or piecemeal, in opposition to the separate ligature of each vessel. That the ligature may be placed without any apparent detriment quite close to the vena cava or aorta is shown by Thornton and Meredith.* The former has related a case in which a clot was found extending into the vena cava, and the latter a case in which the vena cava was unwittingly included in the ligature, but no bad symptoms followed. The situation of the ligature was not discovered till the post-mortem, and had no share apparently in causing the death of the patient.

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* That is to say, passing a needle through the pedicle in several places, and thus securing the several parts, as is done usually with any large piece of omentum in operating for hernia.

It is a remarkable fact, when perusing the literature of nephrectomy, to see how few cases have died from secondary hæmorrhage. At the time of operation the hæmorrhage has often been alarming, and occasionally uncontrollable; † but hæmorrhage at a later period is rare. Out of the fifty-four cases which are related by Barker,‡ in only two cases was secondary hæmorrhage the cause of death, and this series of cases is particularly valuable in determining the likelihood of such an occurrence, as it comprises all the early cases of nephrectomy, when it was impossible that much experience in the treatment of the pedicle could have been gained. The first case of secondary hæmorrhage occurred to Meadows,* and the second to Stockwell.† It may perhaps be worth while to remember that in both of these cases the vessels were ligatured separately, and that to this cause it is not improbable the hæmorrhage may have been due. A ligature threaded through the tissues is certainly more secure from slipping than one placed round the free end of a vessel, however carefully it may be secured. On this point Spencer Wells' remarks on the treatment of the ovarian pedicle may be with advantage quoted. "In ligaturing the pedicle of an ovarian tumour, it is never safe to trust to a ligature which does not *transfix* the pedicle, unless this be very long and slender. Many cases are on record where, after cutting away the tumour, a simple encircling ligature has slipped off, and dangerous or fatal bleeding has followed. It should, therefore, be a rule always to transfix a pedicle, and according to its size tie it in two or more portions."

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* Discussion at the Clinical Society, Oct. 24th, 1884. "Brit. Med. Journ.," Nov. 1st, 1884.

† Hueter (Greifswald), "Deutsch. Zeit. f. Chir.," Bd. ix, p. 572. Elder, "Lancet," 1882, Vol. ii, p. 567.

‡ "Med. Chir. Trans.," Vol. lxiii and lxiv.

To judge from the results of ovariotomy, and from the records of the surgery of the kidney, carbolized silk ligatures, cut short in the wound, will probably give the best results, but with a long pedicle from a suppurating kidney, it is certainly better to leave the ligature long, and let them both come away at a later stage.

THE TREATMENT OF THE URETER is a more debatable subject. By some it has been included in the general ligature of the pedicle. Others have left it without any ligature at all, whilst Thornton has strongly advocated that it should be brought to the outside of the body, where it can either be secured by a ligature or left open. It seems to have been shown in some at least of his cases that the retention of the ureter in the wound gave rise to suppuration, and in one case to a troublesome cystitis, owing probably to the secretions of the wound finding their way into the bladder.* With such facts before us it is scarcely possible to doubt the soundness of the argument in favour of bringing the ureter to the outside of the body. In the lumbar operation there is no difficulty in effecting this, nor is there usually any if Langenbuch's incision be adopted, or if the lateral incision be employed; but if the kidney is removed by mid-abdominal section, it would probably be safer to make an aperture for the ureter in the loin, which aperture could likewise be employed, if need be, for the drainage of the wound. Any attempt to bring the ureter out at the centre of the abdomen, even if it were possible at the time of the operation, would only leave a fibrous cord stretching across the abdomen, which might at any time give rise to internal strangulation. If it is brought out in the loin or anywhere in the side of the abdomen the ureter will, of course, remain as a fibrous cord, but it will be fixed to the parietes, and is not, therefore, liable to be a potential source of danger in the future.

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* "Brit. Med. Journ.," 1871, Vol. ii, p. 44 and 73. No very full details are given, but apparently the vessels were tied separately.

† "Med. Press and Circ.," Nov. 24th, 1880. The vessels were tied separately with silk, and death occurred ten hours later from hæmorrhage from the renal vein.

The treatment of the ureter has been well summarized by Gross in a few words.* "The vesical end of the ureter was fixed outside the abdomen in several cases. In some of the recent discussions at the London Societies *theoretical* objections were urged against this procedure, but its uniform success is a complete vindication of its merits in preventing the access into the deeper parts of the wound of the septic material contained in the ureter."

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* See discussion at the Medical Society, Feb. 9, 1885; also "Med. Times and Gaz.," 1885, Vol i, p. 347.

NEPHROLITHOTOMY.—The mode of performing this operation differs but little from that of nephrotomy, except in the fact that a stone has to be removed from the kidney. As a general rule the lateral or the lumbar incision is to be preferred. When the kidney is reached it should be punctured with a fine needle mounted on a handle, so as to make certain as far as possible before incising it of the presence and situation of a stone. There would seem to be no good reason why the kidney should not be systematically punctured, so as to examine the whole of it, for there is no evidence to show that any harm has occurred from puncture. In the chapter on renal calculus a full description is given of some experiments that were made on the dead body in order to find a calculus. If the needle strike the calculus the operator must at once decide from its situation whether it is better to incise the pelvis of the organ or the kidney substance, and perform whichever operation he selects in the manner before referred to under the head of nephrotomy. If the stone is situated in the pelvis of the kidney, or anywhere in the neighbourhood of the hilus, it will

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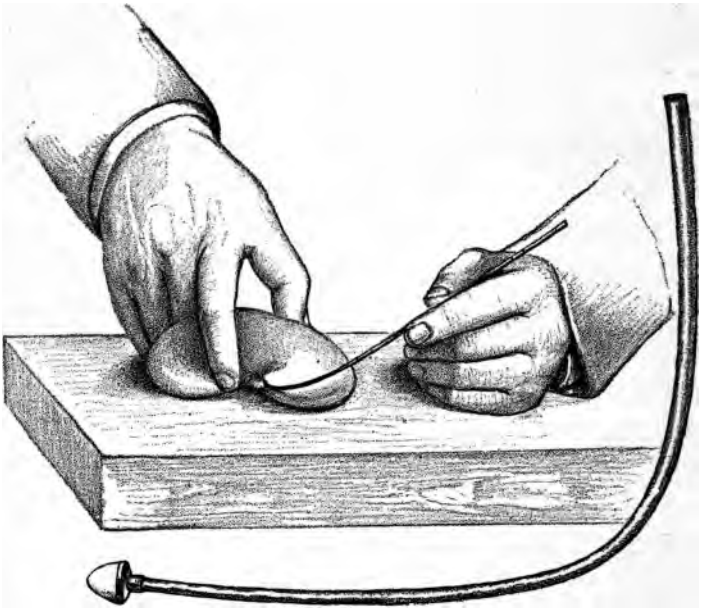
* "American Med. News," Feb. 7, 1885.

Pl. XIX.



EXPLORATION OF THE KIDNEY WITH A SOUND.

The kidney has been removed from the body because of the impossibility of shewing this method on a kidney *in situ*.

T. M GODART. DEL.

TO FACE PAGE 151.

probably be best attacked from that side of the kidney; if, on the contrary, it is fairly near the outside, an incision through the kidney substance would be preferable. It is at present impossible to say how large a stone may be removed with safety, but a case has been recorded in which a stone weighing two ounces and a quarter was removed through the pelvis.*

Supposing, however, that no stone is revealed by the needle, what is to be done next? Under these circumstances the kidney should undoubtedly be incised either in the pelvis or through its substance, so as to reach the dilated upper end of the ureter. It will be found to be easier to explore the inside of the kidney through the pelvis.† A flexible catheter, with a metal or porcelain tip (*vide* Plate XIX.) should then be employed, and a careful exploration must be made both of the inside of the kidney and its ureter in the following manner:—

The sound must be held in the right or left hand according to the fancy of the surgeon, and one of the fingers of the opposite hand must be used from the outside of the pelvis of the kidney to direct it into the various divisions of the pelvis so that each calyx may be explored. After one or two attempts on the dead body no difficulty will be experienced in effecting this. (*Vide* Plate XIX.)

If this method should discover the whereabouts of a stone, it must be removed in accordance with the above-mentioned principles ; if not, the wound should be then closed, or the operator may, if he think fit, pass on to the combined abdominal and lumbar (Thornton's) operation,* or he may close up the wound and wait for another occasion.

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* Horsley, "Brit. Med. Journ.," Sept. 26, 1885—"A Case of Nephrolithotomy."

† The possibility of this method and the experiments on which it is based are discussed in Chapter VI.

This operation is not difficult to perform. After the abdomen has been opened in the middle line or at the outer border of the rectus, one hand is employed to explore the abdomen, and the kidney is carefully palpated. When the operator has determined what part of the kidney to incise, a blunt director is pressed from inside the abdomen upon its back wall, and an incision made from the outside with the other hand ; the stone can then be seized either with forceps or with a scoop, and removed through the lumbar wound, whilst the kidney is kept steady by the hand which is inside the abdomen. If there is a wound in the back surface of the peritoneum over the kidney it should be sutured with catgut, and separate dressings applied to the abdominal and lumbar wounds, which will be treated according to the fancy of the operator, care being taken that there should be plenty of absorbent dressings to catch the drainage from the lumbar wound.

URETEROTOMY OR URETEROLITHOTOMY, whichever may be destined to be the name given to that operation which aims at removing a stone from the ureter, must be performed as follows.

If it is the upper part of the ureter which is to be explored, the operation differs in no way from an ordinary posterior or lateral nephrotomy, except that when the kidney is reached the index finger of the left hand should at once be used to feel for the stone in the pelvis of the kidney. If it is discovered the pelvis must be incised and drained like an ordinary case of nephrotomy.

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* For further account *vide infra*, and for original description see "Med. Times and Gaz.," 1885, Vol. ii, p. 10.

If the stone is not found in this situation, the ureter should be examined with a long bougie à boule, armed with a Nelaton probe end. (*Vide* Plate XIX.)

To remove a stone from the middle of the ureter, the abdomen must be opened by the median or by the lateral incision, and the ureter felt for. If there is a bougie in it this will be easy, if not it will be detected as a cord-like structure, and the stone when found must be cut down upon and removed, care being taken to cleanse the peritoneum as thoroughly as possible afterwards; the wound in the ureter should then be closed by carbolized silk, and edges of the peritoneum united over it. It would probably be advisable to drain the kidney for a few days so as to give the ureter time to heal. It would be as well after removing the stone to make certain that the rest of the ureter was pervious. For this purpose the bougie à boule above described should be passed down into the bladder. If the ureter is to be explored at its vesical orifice, the urethra must be dilated, or if necessary incised in the female, and median cystotomy performed as a preliminary in the male. The index finger of the left hand must then be introduced to steady the stone, and the superjacent bladder wall incised with a guarded bistoury, or a lancet mounted on a long handle, such as is described by Morris. When the stone has been freed, so that it can drop into the bladder, it can be removed with a lithotomy scoop or forceps. The bladder should be kept well drained for a few days.

The operation of **NEPHRORHAPHY** was first described by Hahn.* It consists in making an incision outside the erector spinæ over the kidney as for nephrotomy. When the kidney is reached, an assistant, by pressing on the abdomen, retains it in its proper place, whilst the operator fixes it by means of catgut sutures to the body wall behind. So far not a single death is recorded from this operation (Gross), and if the patient suffer much pain from the movable kidney there would appear to be every justification for its performance, if further experience should demonstrate its success. Hitherto it has not been in this country invariably successful. Greig Smith † has recorded a case in which the kidney, after the recovery of the patient, proved to be just as movable as it was before. Such a case should lead one to try and promote ample adhesions between the kidney and the body by allowing the wound to granulate after the kidney has been firmly attached with sutures.

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* "Centralbl. f. Chir.," 1881, No. 29.

† "Lancet," 1884, Vol. ii, p. 10.

CHAPTER XII.

METHODS BY WHICH ONE URETER CAN BE TEMPORARILY OCCLUDED.

ALLUSION has often been made in the preceding pages to the advisability of ascertaining the actual condition of each kidney before resorting to operation. Various methods have been from time to time suggested for effecting this purpose. The question of their applicability will be briefly considered.

When Simon, of Heidelberg, now more than ten years ago, first removed one kidney, he soon perceived how essential to future success was the determination of the functional activity of each kidney separately, and he himself proposed a plan * of catheterization of the ureters from the bladder, but he only attempted the operation in the female; and though after many unsuccessful attempts and very considerable practice he attained to a fair amount of success, yet absolute certainty he himself admits he could not hope to achieve "with each patient at each sitting."

But if this plan has succeeded ill in Simon's own

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* "Uber die Methoden die Weibliche Urinblase zugänglich zu machen und über die Sondirung des Harnleiters beim Weibe." "Samml. Klin. Vorträge," No. 38.

hands, it has been attended with still less success in those of others.

Deahna[*] states that, after many attempts with Simon's sound, he had come to the conclusion that he had never once attained any satisfactory evidence from its use, and this conclusion is also endorsed by Winkel.[†]

Catheterization of the ureter has also been attempted with some success by Pawlik,[‡] who gave a demonstration on the subject at Salzburg,[§] and published [||] other accounts of his methods. I have not, however, been able to get at any of his original papers.

He appears to be able to accomplish his purpose without the aid of the endoscope, though he also admits that the operation is sometimes impossible to perform.

The question slumbered for a while, but was again brought into notice by Silbermann,[¶] whose attention was directed to the subject by finding one ureter completely occluded by a growth in the bladder, which had prevented the urine from passing along it, and which had given rise to atrophy of the corresponding kidney. He had a silver catheter made with a hole at the side near its end; and when the catheter was safely in the bladder he passed down it an elastic tube, called a

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[*] "Beiträge zur Chirurgie der Nieren nach neueren Mittheilungen zugammengestellt." Schmidt's "Jahrbücher," 1882, Bd. 196.

[†] "Allgemeinen Chirurgie," Pitta Billroth.

[‡] "Wiener Med. Woch.," April, 1881.

[§] "Naturforscherversammlung," Salzburg, 1881.

[||] "Archiv f. Gynækol," 1881, xviii, Band 3. Also "Centralbl. f. Gynækol," 1881, v. Jahrgang, Beilage 2, Nos. 20, 21.

[¶] "Berlin Klin. Woch," 1883, No. 34.

Gummiballon, which he caused to bulge through the openings in the silver catheter by inflating the rubber tube with mercury, until a swelling the size of a hen's egg could be felt through the rectum or vagina, or through both. This ingenious device seems to have been attended with some success in its inventor's hands, but has not commended itself to other surgeons.

About the same time that Silbermann was working at his plan Polk was operating in New York on a patient with only one kidney. This operation has been alluded to more than once in the preceding pages. After his failure he set to work to ascertain how best to determine the existence of two kidneys, and the secreting power of each of them separately, when one was about to be submitted to operation, and he published his results in the same year. *

He discusses the various methods which are open to him, and gives an excellent account of all the possible methods of dealing with the question.

Catheterization of the ureters he dismisses at once, on account of its difficulty and uncertainty. Exploration of the kidney with the hand in the rectum is about equally unsatisfactory, first, because it is dangerous (the peritoneum may be torn); secondly, because it is difficult, especially if the surgeon's hand is not very small; and, thirdly, because the information derived from such a procedure is not reliable.† He dismisses

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* "New York Med. Journal," 1883, Feb. 17th.

† I myself have seen a stricture of the upper part of the rectum remain undiagnosed, though the hand was inserted, and yet a good deal of the interior of the abdomen could be examined, owing to the fact that the rectum had a long mesentery.

summarily all such operations as cutting-down and temporarily tying or clamping the ureter, followed by the injection of iodide of potassium, after which the urine is to be tested for iodine (Glück's method).

There still remain three plans: (1) to examine both kidneys at the time of operation by the abdominal method; (2) to compress the ureter as it passes over the brim of the pelvis with a Davy's lever; and (3) to compress it at its entrance into the bladder.

The first of these plans is, of course, open to the objection that it may involve two operations; one in front to diagnose the disease, and one behind to remove the kidney, for, as we have already seen, if it is in a state of suppuration, which it very likely would be, it ought to be removed by the extraperitoneal method. In addition to this, it is quite possible to conceive that a kidney might be much damaged physiologically, and yet not reveal its damage to palpation through the peritoneum.

Compression of the ureter on the brim of the pelvis by a Davy's lever has been advocated by Davy himself, but it has the disadvantage of a certain amount of uncertainty even on the left side, and of the certainty that it is often inapplicable on the right. Mr. Davy informs me that he can only employ it on the right side when there is a well-developed mesentery to the rectum, and this only occurs on an average once in every three bodies. It must, however, of course be borne in mind that compression of one ureter would be, in most cases, sufficient to determine the state of both kidneys.

Polk himself inclines rather to the idea of the compression of the ureter where it enters the bladder, and describes his plan in the following words:—"Take a piece of block-tin, and bend it to the shape of a Sim's sigmoid catheter, of as great a curve as it is possible to pass into the bladder easily. If the right ureter is to be compressed, pass the instrument into the bladder and two fingers into the rectum, or use in their place a curved and grooved instrument, into the groove of which the curve of the catheter in the bladder will fit. Press the two together and the ureter is occluded. Wash out the bladder and test the urine which is next secreted."

Urine is, he states, passed from a sound kidney at a rate of about one minim in each five seconds, so that the amount required would soon be obtained. The rate of secretion, however, varies greatly under different conditions, so that the above statement must only be taken as an average.

In the female a tenaculum hooked in just below the cervix uteri into the anterior vaginal wall, aids matters very considerably.

The catheterization of the ureter, either with or without the aid of an electric lamp in the bladder, has been attempted by Dr. Newman of Glasgow.* He places the patient in lithotomy position, and introduces the index and middle fingers of the left hand into the vagina, placing them one on either side of the os uteri, which corresponds as nearly as possible with the orifices of the ureters. He then passes a curved catheter

* "Glasgow Med. Journ.," 1883, Vol. xxiv, p. 52.

into the bladder with the right hand and catheterizes each ureter separately.

More recently Tuchmann * has invented an instrument shaped like a lithotrite, with which he proposes to seize the end of the ureter. There are holes in the stem by which the urine can flow out of the bladder. He proposes to feel for the so-called ligamentum interuretericum, and by getting the blades of his forceps one on either side of it, to compress for as long as may be desired one ureter or the other.

Not one of the methods above described can be considered to be absolutely satisfactory, but this much may be affirmed, that no attempt is likely to be successful which does not aim at compressing the ureter either at its entrance into the bladder or where it passes over the brim of the pelvis, and the former situation seems more likely to yield a successful result than the latter. Polk's plan approaches nearer to success than any other.

Catheterization of the ureters is destined possibly to aid in the diagnosis of a stone in the ureter or in the pelvis of the kidney, but it is difficult to see how it could afford any clear evidence of the secreting power of a kidney, unless the catheter could be securely fixed in the ureter for some hours at the very least.

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* "Über den Verschluss der einen Harnleitermundung." "Deutsche Zeit. für Chirurgie," Band v, Heft i.

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